Royal Adelaide Hospital
Emergency Department

Designer Drug Early Warning System (D_2EWS)

12-month Technical Report

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A collaborative project between Drug & Alcohol Services South Australia, Southern Adelaide Health Service; Royal Adelaide Hospital Emergency Department, Central Northern Adelaide Health Service; and Forensic Science SA.

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ABBREVIATIONS AND DEFINITIONS

BAL	Blood alcohol level
BP	Blood pressure
bpm	Beats per minute
CNAHS	Central Northern Adelaide Health Service
CVS	Cardiovascular System
D_2EWS	Designer Drug Early Warning System
DAIS	Department of Administrative and Information Services
DASSA	Drug and Alcohol Services South Australia
DAWN	Drug Abuse Warning Network
DMA	Dimethylamphetamine
DOM	2,5-dimethoxy-4-methylamphetamine
DUMA	Drug Use Monitoring in Australia
ECG	Electrocardiograph
ED	Emergency Department
EECU	Emergency Extended Care Unit
ELISA	Enzyme linked immunosorbent assay
FSSA	Forensic Sciences of South Australia
GCS	Glasgow coma score
GHB	Gamma-hydroxy butyrate (“fantasy”)
GI	Gastrointestinal
HDU	High Dependency Unit
ICU	Intensive Care Unit
IDRS	Illicit Drug Reporting System
IDU	Injecting drug user
LOS	Length of stay
LSD	Lysergic acid diethylamide (“acid”)
MAM	6-monoacetylmorphine
MDA	3,4-methylenedioxyamphetamine
MDMA	3,4-methylenedioxymethamphetamine (“ecstasy”)
MVAs	Motor vehicle accidents
NR	Normal range
OD	Overdose
PDI	Party Drug Initiative
PMA	Paramethoxyamphetamine
PRN	Project Research Nurse
PSC	Project Steering Committee
RAH	Royal Adelaide Hospital
REU	Regular ecstasy users
RR	Respiratory rate
SAPOL	South Australian Police Force
SAAS	South Australian Ambulance Service
THC	Tetrahydroxycannabinol

Definition of categories & terms

Illicit Drug Use	In the context of this report, the term Illicit Drug Use (capitalised) is defined as excessive or non-sanctioned use of both licit and illicit substances, including alcohol, across the spectrum of use from occasional to regular to dependent.
Illicit Drug User/s	Illicit Drug Users are those patients who were categorised as using substances as defined above, on attendance to the RAH ED.
Self-Harm	The primary intention of drug use was to cause suicide, as a “cry for help”, or for other deliberate self destructive purpose; the category that these patients were assigned to on presentation to the RAH ED.
Drink Spiking	The deliberate administration of a drug (or drugs) to a person by addition of the drug to their drink, without their permission; the category of attendees who alleged their intoxication and presentation to the RAH ED was due to drink spiking.

EXECUTIVE SUMMARY

This technical report presents findings from the Designer Drug Early Warning System (D_2EWS). Arising jointly from recommendations of the SA Drugs Summit in 2003 and research interests of the Royal Adelaide Hospital Emergency Department (RAH ED), this project monitors the incidence and clinical effects of intoxicating substances in patients presenting clinically intoxicated to the RAH ED. Initially envisioned to focus principally on psycho-stimulant use in young ecstasy and related drug users, the project's unique design and methodology has allowed identification of patterns of use across the full spectrum of drugs of abuse and has done so in three broad groups of users: Illicit Drug Users (defined here as excessive or non-sanctioned use of both licit and illicit substances, including alcohol, across the spectrum of use from occasional to regular to dependent), drug users intending deliberate Self-Harm, and the victims of Drink Spiking.

D_2EWS is a clinically based, prospective monitoring system, in which blood analysis of intoxicated patients provides precise identification of the intoxicating substances as well as the levels of these drugs in the patients' blood. This information is then able to be correlated with the patients' clinical and demographic details to provide a unique data-set.

The project confirms that alcohol remains the major cause of intoxication leading to attendance at the RAH ED, followed by benzodiazepines, cannabis, amphetamines and opioids. The incidence of psycho-stimulant use is shown to have increased dramatically in the 3 years since pre-study estimates were made, and the use of benzodiazepines among Illicit Drug Users is much higher than previously thought. Other drugs, such as gamma-hydroxy butyrate (GHB), ketamine and lysergic acid diethylamide (LSD), although less frequently detected, are shown to be of major concern given the younger average age of users and the associated clinical harms. Of concern too, is data suggesting significant rates of diversion of prescription medication for Illicit Drug Use, and the substantial proportion of patients with established psychiatric illness.

Multiple drug use by individuals is a major feature of the project's data with nearly 60% testing positive to more than one drug, and almost 20% to 3 or more drugs. This problem has been shown to extend across all drug groups, all ages, and all three presentation categories.

Such data from the D_2EWS project adds to the body of knowledge of the populations that are at most risk of harm from illicit and other drug use. It shows that different categories of presentations to the ED have different patterns of drug use, different demographic details and levels of risk-taking. Further, it is envisaged that analysis of the clinical features associated with the precise quantification of drug levels may allow refining of the emergency management of these patients.

In addition to adding significantly to the understanding of drug use generally in our community, information from D_2EWS has allowed early identification and notification of emerging drug issues to both health and police agencies. For example, following an increase in heroin-related presentations to the RAH ED in September 2005, a *Drug Alert* was published which, in addition to providing advanced notice to the other metropolitan Emergency Departments (EDs), also provided important information to the South Australian Police Force (SAPOL). Similarly, following reports of several LSD-related attendances to the RAH ED in early 2005 the project

began monitoring for this drug. This required the development of new blood testing techniques by the project collaborators at Forensic Sciences of SA. A series of cases were subsequently detected and a specific *Drug Alert* was published.

The project is a unique collaboration between the RAH ED Research Group, which designed and manages the project, clinical staff of the RAH ED, Forensic Sciences of South Australia (FSSA), which performs all drug analyses, and the Drug and Alcohol Services of South Australia (DASSA), which provides expert advice and sourced funding for the project.

OVERVIEW AND COMBINED RESULTS

Enrolments

In the reporting period August 2004 to August 2005 there were 1463 completed enrolments with 1134 (77.5%) patients testing positive to drugs. This enrolment period was divided into an initial six month pilot phase followed by the second, ongoing phase with a slightly modified data-base.

Demographics

Male patients testing positive to drugs outnumbered females 3 to 2. Nearly 90% were Caucasian, 4.5% Indigenous, and less than 2% were Asian. Although the majority of drug positive enrolments (67%) were aged 18 to 35 years, 6% were aged less than 18 years.

Half of all patients presented over the weekend (between Friday 6 pm and Monday 6 am) and the most likely time of day to present was between midnight Saturday and 6 am Sunday. The location of drug use was most frequently a private residence (53%), usually the patient's own home, whilst 28% reported drug use at licensed premises.

Patterns of Drug Use

A total of 63 different pharmaceutical and illicit drugs were detected with a total of 2405 positive drug tests. Most patients presented as a result of Illicit Drug Use (61%), followed by Self-Harm (25%), and alleged Drink Spiking (8%).

Alcohol was the most common drug detected (670 of 1134 (59%) drug positive patients). Benzodiazepines were the next most commonly detected drugs with 608 positive tests in 397 patients (35% of total drug positive patients), followed by cannabis (tetrahydroxycannabinol (THC)) with 259 patients (23%), amphetamines with 341 tests in 247 patients (22%), and opioids with 189 tests in 149 patients (13%). Antidepressant and antipsychotic drugs were also commonly detected (in 130 and 33 patients respectively).

Poly-substance use (>1 drug per person) was evident in 58% of drug-positive patients; 18% of patients tested positive to 3 or more drugs. The most number of drugs detected in any 1 patient was 7. The most common combination of drugs in Illicit Drug Users was alcohol plus THC, whilst in Self-Harming patients it was alcohol plus benzodiazepines.

Clinical Correlates

In those patients from whom the data could be collected, almost a third (31%) had a documented past history of drug abuse or dependency, whilst a larger proportion (58%) of

patients had a history of psychiatric illness. Although the majority of patients with a history of depression presented as a result of deliberate Self-Harm, those with a history of a major psychotic illness were more likely to present intoxicated as a result of Illicit Drug Use.

Over half of drug-positive patients were determined to require immediate or urgent medical assessment compared to a rate of 23% for ED attendances generally during the same period. An altered heart rate was the most common abnormal clinical sign (4% having a bradycardia and 30% a tachycardia), with an abnormal temperature also commonly seen (20% of patients were hypothermic, 4% hyperthermic). Almost 10% of patients had severely depressed conscious state with a Glasgow Coma Score of less than 8. Additionally, an agitated delirium or acute psychosis was seen in 12% of patients at presentation. The admission rate for drug-positive patients was 50%, compared to an overall admission rate for all ED patients of 36%.

Although drug-positive patients presenting to the ED generally required more urgent treatment and had higher admission rates than average, the majority (approximately 80%) were able to be discharged from hospital to home in less than 24 hours. However, almost 10% of patients required Intensive Care or High Dependency admission, and 7 patients died. Also of concern was the fact that 12% of admitted patients, mainly Illicit Drug Users, left hospital against medical advice.

All but 1 of the 7 fatalities were aged 35 years or less; 3 were aged less than 18 years. Four deaths were the result of deliberate Self-Harm, with hanging the immediate cause of death in 3. Of the 3 deaths directly attributable to drug toxicity, one was due to opiate overdose, one to intra-cerebral haemorrhage following amphetamine use, and one was the result of an industrial chemical ingestion (ethylene glycol or ‘anti-freeze’)

RESULTS BY PRESENTATION CATEGORY

Illicit Drug Use

Enrolments:

Illicit Drug Use was the most commonly cited reason for the drug exposure of all enrolled patients (69%) and was the group with the largest number of drug positive results (61% of all drug-positive patients).

Demographics:

Male Illicit Drug Users outnumbered females 7 to 3. The average age of Illicit Drug Users was approximately 31 years, with 5% under 18 years of age and 6% older than 50 years.

Almost 90% of Illicit Drug Users were Caucasian. Indigenous patients constituted 6% of this group and were more likely to present as a result of Illicit Drug Use than other ethnicities (80% of Indigenous enrolments, 60% of Caucasian, and 50% of Asian).

The most commonly reported venue of drug exposure in this group was a private residence (42%) which contradicts the commonly held perception that most presentations are sourced from inner city licensed venues. Although 73% of Illicit Drug Users were brought to the ED by the ambulance service, a significant minority (8%) were brought by SAPOL or other custodial services. This compares with an overall custodial rate of 1.7% for all ED attendances.

Patterns of Drug Use:
A total of 1403 positive drug tests were returned from the 687 patients categorised as Illicit Drug Users. Alcohol (detected in 63% of patients), benzodiazepines (29%), amphetamines (28%), THC (27%), and opioids (12%) were the most commonly detected drugs. Five percent of Illicit Drug Users tested positive for an antidepressant.

Indigenous patients were more likely to return tests positive for benzodiazepines and THC, and less likely to test positive for an amphetamine, or for ecstasy (MDMA) and related substances such as GHB, LSD or ketamine.

Detection rates for psycho-stimulants were much higher than anticipated (28% of Illicit Drug Users were positive for a psycho-stimulant as compared to the pre-study estimate of 5% of all users). The large majority (77%) of psycho-stimulant results were returned in Illicit Drug Users. The most frequently detected psycho-stimulant was methamphetamine (52%), followed by MDMA (29%), and amphetamine (17%).

Overall detection rates for opioids were lower than expected. Very low rates of heroin detection may relate to its rapid metabolism to morphine and /or delayed presentation. A steep increase in heroin-related presentations was reported in September 2005 with release of a D_2EWS “Drug Alert”.

There is evidence suggesting significant diversion and abuse of the prescription opioids morphine and methadone with up to 50% of opiate related presentations testing positive to these drugs.

Although benzodiazepines were the second most frequently detected drug group in intoxicated Illicit Drug Users their use was very much under-reported by the patients who tested positive to them when compared to the reporting rates for other drug types. It is possible this low reporting rate reflects a perception by patients that they are not a drug of abuse, either because many are prescribed or, as has recently been suggested they may be commonly used to self-medicate against adverse effects of other “primary” drugs of abuse such as opiate and amphetamine withdrawal.

The large majority of patients testing positive for one or more of the “club drugs” were in the Illicit Drug Use category. Of these MDMA (ecstasy) was by far the most frequently detected (77 patients). By comparison GHB was detected in 31, ketamine in 5, cocaine in 6, and LSD in 5 patients in the Illicit Drug User group.

Poly-substance abuse was particularly prominent with 59% of patients testing positive to more than 1 drug; 6% tested positive to more than 3 drugs.

Apart from those cases listed as “drugs misuse”, the largest proportion of patients presented as a result of trauma (99 patients, 25%), cardiovascular or neurological complications (46 patients (11%) and 69 patients (17%) respectively), or psycho-social complaints (43 patients (10%)).

Self-Harm

Enrolments:

A total of 280 drug-positive patients (25% of total) presented intoxicated as a result of drug use in association with deliberate Self-Harm.

Demographics:

The male to female ratio of intoxicated patients presenting as a result of deliberate Self-Harm was approximately 3 to 4, except in those aged less than 18 years where the gender ratio was reversed (5 male to 2 female). Nearly all patients (95%) were Caucasian with a much smaller proportion of Indigenous patients than in the Illicit Drug User category (2.5% of Self-Harm patients compared to 6% of Illicit Drug Users). The average age was 34.5 years, with 5% aged less than 18 years and 7% aged over 50 years.

The day and time of day that patients in this category presented was more evenly spread over the week and the time of day than was seen in Illicit Drug Users. The venue of drug exposure was almost exclusively a private residence.

Patterns of Drug Use:

Benzodiazepines, opioids, antidepressants and antipsychotics were proportionally more common and alcohol, amphetamines, and ecstasy and related drugs, proportionally much less frequently detected when compared to Illicit Drug Users.

Benzodiazepines were the most frequently detected type of drug with 252 positive tests in 164 patients (59%). Alcohol was detected in 50% of patients and cannabis (THC) in 14%. Codeine was the most commonly detected opiate in this group (59%). The most frequently detected psycho-stimulant was methamphetamine (52%). However, a surprisingly high 7 out of 10 patients testing positive to pseudoephedrine were in the Self-Harm group.

Multiple drug use was again a feature with 687 positive drug tests returned from the 280 patients. More than two thirds of patients (67%) tested positive to more than 1 drug compared to 59% in Illicit Drug User group.

Drink Spiking

Enrolments:

Of the 99 patients enrolled as having presented intoxicated or poisoned as a result of alleged Drink Spiking, 88 (89%) returned blood tests positive for the screened compounds (8% of all drug-positive enrolments).

Demographics:

The male to female ratio was 1 to 2, the reverse of that seen with enrolments generally and of the Illicit Drug User group. The gender ratio reverted to male predominance with regard to the presence of drugs other than alcohol.

A higher proportion of patients in this group were not Caucasian (16% compared to 10% of Illicit Drug Users and 5% of Self-Harm). The average age was lower than other enrolment groups at 26.8 years. Of major concern is the fact that over 10% of patients were under 18 years of age.

The large majority of drug exposures occurred in a licensed venue (55% in public bar, 31% in a night club). The most likely time of presentation to the ED was between midnight and 6 am Sunday. A smaller proportion of victims of Drink Spiking arrived at the ED via ambulance compared to the other enrolment groups.

Patterns of Drug Use:
A total of 120 positive drug tests were returned from the 88 victims of alleged Drink Spiking giving an average of 1.4 drugs detected per patient.

Alcohol was the drug most commonly detected (77% of patients), and was the sole drug detected in 65%. A lower average alcohol concentration than illicit users (0.14g/100mL compared to 0.16 g/100mL) and a much lower maximum blood level (0.25g/100mL compared to 0.42g/100mL) may suggest comparative alcohol naivety in this group.

Surprisingly, amphetamines were the next most frequently detected drug (24%), followed by benzodiazepines (9%), and THC (8%). Some of the highest blood levels of MDMA and methamphetamine were detected in victims of alleged Drink Spiking. GHB was detected in 4 patients, never in association with alcohol, but in association with an amphetamine in 3 cases. No opioids were detected in patients in this group. Six percent of patients tested positive to 3 or more drugs.

Thirteen patients (15%) required admission to hospital, including 2 patients requiring Intensive Care. All were eventually discharged, with only 2 patients staying longer than 24 hours.

Unknown and Suspected Drug Use
A total of 61 drug-positive patients were enrolled with insufficient information to determine drug use intent. Demographic data and patterns of drug use of patients in this category broadly matched that seen in the Illicit Drug User category.

Iatrogenic & Accidental Poisoning
The number of patients with positive drug screens who were enrolled as a result of iatrogenic toxicity or due to accidental poisoning was small (2 and 16 patients respectively), and significant patterns or trends in drug exposure could not be detected.

RESULTS BY DRUG TYPE

Alcohol
Enrolments:
More patients tested positive to alcohol than any other drug with 670 (59%) of the 1134 patients returning alcohol-positive blood tests.

Demographics:
Of the patients testing positive for alcohol, 90% were Caucasian, 5% Indigenous and 2% Asian. The average age was 31.4 years, and 6.5% were aged less than 18 years. The male to female ratio was 3 to 2, other than for those less than 18 years old where the ratio was 1 to 1. The most likely time of presentation was between midnight and 6am Sunday, whilst over 50%

presented between 6pm Friday and 6am Monday. Nearly half of the alcohol exposures occurred at a private residence compared to 31% at licensed premises.

Patterns of drug use:
Most alcohol-positive enrolments were in the Illicit Drug User category (65%). However, proportionally, the victims of Drink Spiking category had the highest percentage of alcohol positive patients (77% compared to 63% of Illicit Drug User group and 50% of Self-Harm drug use group).

Only 43% of alcohol-positive patients did not return a positive test for another drug. A total of 662 tests positive for drugs other than alcohol were returned from the 670 patients: 248 benzodiazepines, 117 THC, 90 amphetamines, 66 opioids, 61 antidepressants and antipsychotics. MDMA was the psycho-stimulant most frequently associated with alcohol.

The incidence of injecting drug abuse previously documented in case records of patients testing positive for alcohol was low (6%) although an established past history of drug abuse was reported in 167 patients (25%) who tested positive to alcohol.

Amphetamines
Enrolments:
Of the 1134 enrolled patients returning positive drug tests, a total of 247 patients (22%) tested positive to a psycho-stimulant.

Demographics:
The male to female ratio of psycho-stimulant positive patients was 3:2 other than for those under 18 years of age where the gender ratio was reversed. Over 92% of patients were Caucasian. Although amphetamines were detected in 6 of the 51 Indigenous patients (12%), this represented only 2% of all patients testing positive to these drugs.

The average age of patients testing positive for amphetamines was 27.8 years with 6% aged less than 18 years. Patients testing positive to MDMA were on average more than 2 years younger than those testing positive to methamphetamine and 3 years younger than amphetamine-positive patients.

Almost two thirds (61%) of patients presented over the weekend (between 6pm Friday and 6am Monday), and the most likely time of presentation was between midnight and 6am Sunday.

Over 50% of psycho-stimulant exposures occurred in a private residence and 33% occurred in licensed premises. This ratio however was reversed with MDMA exposures where 22% occurred at a private residence and 62% at a licensed venue.

Patterns of Drug Use:
Rates of psycho-stimulant detection were greater than the pre-study prediction (22% of all enrolments and 28% of Illicit Drug Users compared to the predicted 5%). A total of 341 drug tests positive for amphetamines were returned in the 247 patients at an average of 1.4 amphetamines per patient. Proportional rates of detection were similar in Illicit Drug Users and victims of Drink Spiking.

Methamphetamine was the most frequently detected amphetamine (53%) followed by MDMA (28%) and amphetamine (15%). Much of the amphetamine and MDA detected may be as a result of metabolism of methamphetamine and MDMA respectively. Small numbers of MDA and MDEA positive results were returned and were most likely additives to MDMA tablets.

There were 304 tests positive to drugs other than amphetamines in this group of which 26% were benzodiazepines, 25% alcohol, 21% THC, 9% opioids, and 5% antipsychotics or antidepressants. Almost a third (32%) of patients testing positive to a psycho-stimulant were injecting drug users (IDU) and 9% of patients were Hepatitis C positive.

Benzodiazepines

Enrolments:

Of the 1134 enrolled patients returning positive drug tests, a total of 397 patients (35%) tested positive to benzodiazepines; this was second only to alcohol with 670 patients.

Demographics:

The male to female ratio among patients testing positive for benzodiazepines was less than for other groups, at 5 to 4. Most (90%) were Caucasian, however, benzodiazepines were detected in 24 Indigenous patients representing a detection rate of 47% of all drug positive Indigenous patients.

The average age of benzodiazepine-positive cases (35.6 years) was older than that seen for other drug types, except for opioids, and a smaller proportion was less than 18 years of age (2.5%).

The most likely time of presentation for those testing positive for benzodiazepines was between 6pm and midnight on a Thursday, with only 24% having presented over the weekend (between 6pm Friday and 6am Monday), the least of any group.

Over 60% of drug exposures occurred in a private residence with only 5% in licensed premises.

Patterns of drug use:

The majority of benzodiazepine-positive patients (50%) presented as a result of Illicit Drug Use rather than Self-Harm (41%). There were 574 tests positive to drugs other than benzodiazepines among this group: 44% alcohol, 25% THC, 23% opioids, and 20% psycho-stimulants. Thirty two percent had a documented past history of injecting drug use, 50% of whom were hepatitis C positive.

Cannabis

Enrolments:

Of the 1134 enrolled patients returning positive drug tests, a total of 259 patients (23%) tested positive to THC, the main indicator of cannabis use. This was the third most commonly detected drug after alcohol (59%) and benzodiazepines (35%).

Demographics:

The male to female ratio among patients testing positive to THC was 3 to 1, and 86% of patients were Caucasian. THC was detected in 23 Indigenous patients, representing a

detection rate of 45% amongst the Indigenous patient group (23 of the 51 patients), the third highest after alcohol (69%) and benzodiazepines (47%). The average age of patients testing positive to cannabis was 29.8 years, and 6% were under 18 years of age.

Time of presentation was much more evenly spread across the week and time of day when compared to other drug types. Over 60% of drug exposures were at a private residence and 14% were in a licensed venue.

Patterns of drug use:
Rates of THC detection (23%) approximated our pre-study estimated detection rate of 25%. The large majority (70%) presented as a result of Illicit Drug Use. THC was rarely detected in isolation with only 12% testing positive to THC alone. A total of 631 positive drug tests were returned on the 259 THC-positive patients, equating to an average of 2.4 positive drug tests (including THC) per patient. Fourteen percent of patients tested positive to 3 or more drugs additional to THC. The highest average THC blood levels were seen among the Illicit Drug User group.

Of those testing positive to THC, 47 patients (18%) had a documented history of being an injecting drug user and 22 were Hepatitis C positive. Twenty eight percent of those testing positive for THC had a documented past history of psychiatric illness (126 specific conditions), and 22% had a history of drug/and or alcohol abuse. Four of the 6 deaths that occurred among enrolments to the study, including 3 of the 4 suicides, tested positive to THC.

Opioids
Enrolments:
Of the 1134 enrolled patients returning positive drug tests, a total of 149 patients (13%) tested positive to opioids.

Demographics:
The majority (95%) of opioid-positive patients were Caucasian, with only 4% Indigenous patients. However, the rate of opioid detection within Indigenous patients was 12%, which was similar to that for Caucasians.

The average age of those testing positive to opioids was 35.6 years, the oldest of all drug types, and only 5 patients were less than 18 years of age, all of whom tested positive to codeine. The overall male to female ratio was 3 to 2, and as per other drug types the gender ratio reversed in those less than 18 years of age. Presentations were relatively evenly spread across the week and time of day. Over 60% of drug exposures occurred at a private residence with only 2% of exposures occurring in licensed premises, the lowest of any drug group.

Patterns of Drug Use:
Rates of detection of opioids were similar to the pre-study estimates (13% compared to an estimated 10%). The majority of opioid-positive patients presented as a result of Illicit Drug Use (56%), with 34% presenting as a result of deliberate Self-Harm. No victims of Drink Spiking tested positive for an opioid.

The majority (42%) of opioid-positive tests were for codeine, and divided equally across the Self-Harm group and the Illicit Drug User group. While the presence of codeine was explained by its association with paracetamol among the Self-Harm group, it was not possible to draw conclusions as to purpose of codeine use (medical or non-medical) among the Illicit Drug Use group. Surprisingly low rates of heroin detection were thought likely due to rapid metabolism of the drug prior to blood sampling being performed. Substantial rates of detection of morphine and methadone suggest a problem with diversion of these restricted prescription drugs.

A total of 189 opioid-positive drugs tests were returned in the 149 patients, with 37 patients (25%) testing positive to more than 1 opioid. There were 342 tests positive for drugs other than opioids: 65% benzodiazepines, 13% alcohol, 11% THC, and 7% psycho-stimulants.

Almost half (47%) of the opioid-positive patients had documentation of previous injecting drug use, and of these, 49% were Hepatitis C positive.

Gamma Hydroxy Butyrate (GHB)

Thirty-six patients (3% of drug-positive enrolments) tested positive to GHB and their average age was 28.3 years, with only 1 patient being less than 18 years of age. The large majority (95%) of GHB-positive patients were Caucasian and presented as a result of Illicit Drug Use (31 of 36 patients, 86%). Four patients presented as a result of Drink Spiking. The most likely time of presentation was somewhat later than other drug groups, between midnight and mid-day, but once again the majority presented over the weekend. A quarter of GHB exposures occurred in licensed premises, whilst 20% occurred at a private residence.

Only 11 patients (31%) tested positive to GHB alone, with 74 tests positive for drugs other than GHB returned in the remaining 25 patients. The most common additional drugs detected were psycho-stimulants, particularly methamphetamine. In contrast to other drug groups alcohol, THC and benzodiazepines were relatively infrequently detected in combination with GHB. The majority (58%) of GHB-positive patients had GHB blood levels in the toxic range at the time of sampling.

Patients typically presented as a result of collapse with an altered conscious level. Two cases received physostigmine as treatment, the clinical effects of which are unclear.

Cocaine

Eight patients (0.7% of drug-positive enrolments) tested positive for cocaine or its metabolite benzylecognine. All were Caucasian and all patients were aged between 18 and 35 years**.** Two patients were reported to have used the drug in association with deliberate Self-Harm; all others fell into the Illicit Drug User category. All but 1 patient tested positive to other drugs, mostly benzodiazepines and amphetamines. Three patients had documented previous injecting drug use, one of whom was Hepatitis C positive.

Ketamine

Six patients (0.5% of drug-positive enrolments) tested positive for ketamine. All were Caucasian and all but 1 presented as a result of Illicit Drug Use; the remaining case may have received the drug as part of their medical management. All tested positive to multiple drugs and all tested positive to alcohol. None had a previous known history of IDU.

Lysergic acid diethylamide (LSD)

In March 2005, following several presentations to the RAH ED over a short space of time, a *D_2EWS Drug Alert* was released and testing of enrolled patients for LSD commenced. This required development and validation of new testing systems to reliably detect the minute levels of this drug in blood. Subsequently, 5 patients (0.4%) tested positive to LSD. All the patients testing positive for LSD were Caucasian males. Two patients were less than 18 years of age. The majority presented over the weekend however, time of day of presentation was variable. Only 2 of the presentations were related to "Rave Parties"; drug exposure in the remainder occurred at a private residence. All LSD-positive patients fell into the Illicit Drug User category.

Antidepressants and Antipsychotics

One hundred and thirty patients (11% of positive enrolments) tested positive for antidepressants, and 33 for antipsychotics (3%). Caucasians accounted for all antipsychotic positive enrolments and 94% of antidepressant positive enrolments. The majority were between 18 and 35 years of age. Of those testing positive for antidepressants 5% were less than 18 years of age. Females outnumbered males 2 to 1 in the antidepressant group. Most of the drug exposures occurred at a private residence.

Over one third of patients who tested positive to an antidepressant presented other than in association with Self-Harm, including 28% presenting with Illicit Drug Use. For patients testing positive for antipsychotics only 12% were in association with Illicit Drug Use. Citalopram (29%) and Venlafaxine (33%) were the most frequently detected antidepressants, Olanzapine (32%) and Chlorpromazine (24%) the most frequent antipsychotics. The majority of patients tested positive to more than 1 drug, with 22% testing positive to more than 3 drugs. The most commonly detected drugs were benzodiazepines, alcohol, and THC. A past history of IDU was reported in 16% of antidepressant positive patients and 21% of antipsychotic positive patients.

SUPPLEMENTS

S1 Trauma

Collection of data specific to trauma patients commenced in February 2005. In the 12 months to February 2006, 10% of drug-positive enrolments (136 of 1377) had presented as a result of trauma.

Motor vehicle accidents (MVAs) were the most common cause of trauma (53%) followed by assault (40%). The majority of drug-positive patients were male (80%), Caucasian (84%), and aged between 18 and 35 years of age (72%). The most likely time of presentation was between midnight and 6am Sunday, and 50% presented over the weekend. Nearly half of the drug exposures recorded occurred in licensed premises, and most (80%) were Illicit Drug Users.

The most frequently detected drugs were alcohol (70% of trauma patients), THC (38%), amphetamines (21%), and benzodiazepines (16%). Poly-substance abuse was common (49% of all trauma and 51% of MVA patients were positive to more than 1 drug).

S2 Injecting Drug Users (IDU)

The period of data collection specific to IDU covered by this section was from August 2004 to February 2006. Of the 1530 drug-positive enrolments in this period 138 patients (9%) were

identified as IDU. Ninety one percent were Caucasian, the remainder (9%) identifying as Indigenous. The male to female ratio was approximately 5 to 2, and just fewer than 90% presented as a result of Illicit Drug Use.

The most frequently detected drugs in these patients were: benzodiazepines (49%), amphetamines (47%), THC (47%), opioids (36%), and alcohol (28%). None of the ecstasy (MDMA) and related drugs, such as GHB or ketamine, were detected in IDU patients; 2 cases were positive for LSD. Poly-substance abuse was prominent in IDU patients, with 80% tested positive to more than 1 drug, 17% to more than 3 drugs (an overall average of 3.0 drugs per patient).

SECTION1 INTRODUCTION

The Designer Drug Early Warning System (D_2EWS) was one of 14 priority initiatives announced by the Premier of South Australia, The Hon Mike Rann, in September 2003, arising from recommendations of the SA Drugs Summit. The focus of the Summit was illicit drug use, with an emphasis on amphetamine-like substances (including 'designer drugs') and broader substance use issues as they relate to young people and Aboriginal people. The need for more detailed information on the patterns of use of such substances was identified at this summit.

The D_2EWS Project is designed to be a sentinel monitoring system with the primary aims of objective data collection and of improving the timeliness of reporting of changing trends in illicit drug use. As such, the system might better enable health and law enforcement authorities to provide relevant harm reduction and prevention strategies.

Demographic, clinical and toxicological data is collected from patients presenting to a tertiary referral emergency department (ED) with acute intoxication or toxicity as a result of drug use. This data is correlated with precise drug identification and blood drug levels through blood testing. The combination of medical assessment, patient interview, accurate drug identification, and precise blood drug level determination provides a unique dataset in Australasia. It is anticipated this dataset might also contribute to clinical information on the harms associated with illicit drug use.

D_2EWS is a collaborative project between the Central Northern Adelaide Health Service (CNAHS) Royal Adelaide Hospital (RAH) ED, the Drug and Alcohol Services of South Australia (DASSA), and Forensic Science of South Australia (FSSA).

This technical report presents the methodology and examines the completed findings for the first twelve months of the D_2EWS project (formally known as the Sentinel Monitoring System) from commencement on the 5th August 2004.

BACKGROUND

Over the past decade notable changes have occurred in the pattern of use of illicit drugs in the Australian community. These have included: an increase in the proportion of the population using illicit drugs; an expansion in the range of substances being used; a willingness to experiment with newer substances; and, of particular concern, a significant increase in the rate of change of patterns of drug use.

The shifting trends and the rate of change can be seen in data showing that, between 1995 and 2004, the proportion of South Australians aged 14 years and older reporting 'recent use' (i.e. use in the previous 12 months) of amphetamines increased from 1.4 to 4.4%. Recent use of ecstasy more than doubled over the same period from 038% of the population in 1995 to 2.8% in 2004[1]. Most recently a United Nations Report has indicated that Australia is the highest user of ecstasy and the second highest user of methamphetamine in the world[2]. In addition over a third of Australian regular ecstasy users report having binged on ecstasy, possibly the most dangerous form of drug use after injecting drug use[3].

Efforts to minimise the harmful effects of drug use on both individuals and communities through legislation, education, and health programs, are also evolving. Central to these efforts

is the need for timely, accurate information. There are currently four main monitoring systems in place in Australia: Coronial inquiries into drug related deaths; data from police drug seizures and related intelligence; voluntary interviews of drug users and experts in the area (as part of the Illicit Drug Reporting System (IDRS) and the Party Drugs Initiative (PDI); and, urine drug screening and voluntary interview of police detainees (through the Australian Institute of Criminology's Drug Use Monitoring in Australia (DUMA) project). The IDRS and PDI focus on use, rather than harm, and use interviews with a pre-selected group or subset of self identified ecstasy users, rather than all drug users. DUMA differs in that is focuses on the criminal element, many of whom are not representative of the dance/pill-taking scene.

There is often an extended time delay to the availability of data relating to emerging patterns of drug use from these systems. For example, the IDRS and PDI reports are produced annually, and Coronial Inquest reports are generally available only many months after the event. The potential value of an earlier warning system for emerging drug use trends was highlighted by the rapid spread of abuse of GHB or "Fantasy" across Australia during early 2000. Reports in the press of its use in Queensland preceded the first presentations to the RAH ED by a matter of weeks. This brief forewarning, however, enabled the Department to prepare an appropriate education package and management protocol prior to presentation of the first serious cases locally[4]. One of the core aims of D_2EWS is to provide early warning of emerging trends to health and policing authorities to assist in timely development and implementation of relevant harm reduction and prevention strategies.

Accurate measurement of drug use in the community is problematic; the illicit nature of the majority of these substances means that information must often be gained indirectly. Data is often anecdotal, subjective, or derived from specific, small target groups, such as prison populations, with potentially limited applicability to the broader community.

Correlation of demographic, clinical and other data with precise drug identification may be even more difficult. For example, data derived from interview may not accurately reflect what drugs are actually being used as the user may themselves not know. This might be particularly so with ecstasy and related drugs, and in relatively naive users. It is known from forensic analysis of drug seizures that tablet composition may vary significantly from their perceived content[5]. Where accurate drug identification is attempted (e.g. DUMA) this is usually done via urine drug screening which gives limited information on dosages used, the timing of drug use, or the presence of other substances outside the standard screen test. For example, urine analysis may remain positive for 7 to 10 days following use of cannabinoids and bears little correlation to blood levels at time of presentation[6]. Conversely, GHB is only fleetingly present, usually undetectable 6-12 hours post ingestion[7]. Precise identification of the drug or drugs involved by analysis of a blood sample is central to D_2EWS. The use of blood analysis for both initial qualitative screening and subsequent quantification allows more accurate correlation between drug level and clinical signs and symptoms than is the case with urine drug screening.

Available data on clinical harm across the broader community associated with drug use and abuse suffers from similar limitations. Small sample size analyses, use of potentially skewed sample groups, inability to correlate with accurate drug identification, limited medical reporting and over-reliance on anecdotal reports are all issues potentially affecting our ability to

accurately determine the adverse effects of illicit drug use in our community. The D_2EWS methodology is 'clinical harm' focussed. Because of the central nature and location of the testing site it allows for screening of large numbers of patients and therefore is likely to produce more broadly representative data (see Methods section). Models similar to D_2EWS are currently successfully employed in North America[8], (Drug Abuse Warning Network (DAWN)) and Europe (REITOX).

OBJECTIVE

The primary objective of D_2EWS is to enhance the evidence available to guide health and law enforcement activities in reducing harm arising from psycho-stimulant and other illicit drug use. In particular, the initiative is designed to enable the development and implementation of timely prevention and intervention strategies in line with the changing picture of substance misuse and the potentially fatal consequences.

This has been done by establishing a clinical toxicology database and monitoring process for drugs of abuse in patients presenting to the RAH ED.

Information from the D_2EWS is to be used for:

- The early identification of new illicit substances of abuse;
- The early identification of changing trends in substance abuse;
- Determining the relationship between quantified blood drug levels and the clinical features of presentation;
- Assessing the accuracy of physician suspicion of illicit drug use by patients; and,
- Determining the demographics and patterns of drug abuse in the target population.

SECTION 2 METHODS

PROJECT DESIGN

D_2EWS is a sentinel monitoring system for illicit drug use in South Australia. The project prospectively collects and records data on illicit drug use in clinically intoxicated or poisoned patients presenting to the RAH ED. Two broad categories of data are recorded:

- The results of qualitative and quantitative analysis of patients' blood for the presence of specific drugs;
- Patient demographic information and clinical details of the presentation;

SETTING

The RAH is a public, 620 bed, adult-only, tertiary referral teaching hospital situated in the centre of Adelaide, a city of approximately 1 million people. It is a major trauma centre and provides state-wide emergency retrieval services. The RAH ED sees approximately 57,000 patients per annum, is the only public inner-city ED and therefore provides emergency serves to most of the after-hours city entertainment venues.

SUBJECTS

All patients aged 15 years and over presenting to the RAH ED with clinical suspicion of drug overdose or intoxication for whom it is clinically indicated to perform diagnostic venous blood sampling are eligible for inclusion. Persons aged less than 15 years, or refusal by a mentally competent patient to have clinically indicated diagnostic blood sampling are excluded, as are those in whom blood testing is not clinically indicated. Patients are medically assessed and managed in all other ways in the usual manner. Enrolment is convenience-based by the treating ED clinicians.

PHASE 1 AND PHASE 2

There were 2 distinct phases of the study. Phase 1 was the pilot phase, running from August 4th 2004 until January 2005. The second phase began in February 2005 and is ongoing.

The second phase followed an interim review of the first period of data and involved the addition of several new data points and the refinement of the original data points. The database was redeveloped to allow for these changes. No data points from Phase 1 were omitted in Phase 2. The new and refined data points are as follows:

- Time of day in a 6 hour block
- Year of presentation
- Age at presentation
- Mode of arrival to hospital
- Presenting complaint by body system and detail
- Incident postcode
- Second destination post ED
- Discharge diagnosis
- Cause of death
- Past medical/psychiatric history (refined)
- Resuscitation interventions (refined)

This document reports data from the first 12 months of the study – all of the data from Phase 1 (6 months), and 6 months from Phase 2. Hence some of the data points are available only on the later data. All data for Supplement 1, "Trauma" was collected from February 2005 onwards. No data points from Phase 1 were omitted from Phase 2.

INTERVENTIONS AND MEASUREMENTS

Patients presenting to the ED with a diagnosis of overdose or clinical intoxication are assessed and managed in the usual manner. The clinical details of their presentation are recorded on a specifically designed *pro forma* Toxicology Data Sheet (UR 9.7T) that constitutes the medical record of attendance and remains with the patient's case records.

Each presentation is classified according to what the treating clinician felt the most likely cause or intent of the drug exposure was. Seven presentation types (or categories) are defined:

- Illicit Drug Use[a]: the primary reason for the drug exposure was for self gratification;
- Self-Harm: the primary intention of drug use was to cause suicide, as a "cry for help", or for other deliberate self destructive purpose;
- Accidental Poisoning: the drug exposure occurred inadvertently;
- Drink Spiking: the drug was administered by a third person by addition to a patient's drink without their permission;
- Iatrogenic Poisoning: resulting from the action of healthcare professionals;
- Suspected: patient's presenting condition is thought likely due to intoxication or poisoning from a drug exposure but there is no information available on likely cause or intent; and,
- Unknown: where no classification is recorded.

Within two weeks of discharge from hospital the Project Research Nurse (PRN) reviews the patient's case notes to complete data collection on:

- Clinically important details at the time of presentation recorded elsewhere in the notes than on the UR 9.7T;
- Length of hospital stay;
- Patient outcome;
- Discharge diagnosis; and,
- Demographic details not already recorded.

The following strategies to maintain accuracy and minimise inconsistencies in the data collection were implemented:

- ED medical staff enrolling patients received a period of instruction and training in completion of the RAH Data Collection Form,

[a] *In the context of this report, the term Illicit Drug Use (capitalised) is defined as excessive or non-sanctioned use of both licit and illicit substances, including alcohol, across the spectrum of use from occasional to regular to dependent. Illicit Drug Users therefore, are those patients who were categorised as using substances in such a manner, on attendance to the RAH ED.*

- The PRN and investigators involved in Case Records reviews received a period of instruction in data abstraction prior to commencement of the study;
- Data variables were pre-defined;
- Regular meetings of the Project Team to review coding rules and interpretations, and to monitor the chart abstractions are held; and,
- The data abstractors are blinded to the results of the blood tests.

Each enrolment is ascribed a specific randomly assigned project number which relates to a corresponding Project Pack. An additional 5ml of blood is drawn from enrolled patients at the time of their other routine blood tests, and is placed in 2 designated fluoride oxalate bottles. These are placed in secure, refrigerated storage until forwarded to the Forensic Science laboratory at the Department of Administrative and Information Services (DAIS). The analyses of primary interest include: ethanol, opioids, amphetamines[b], benzodiazepines, cannabinoids, GHB, ketamine, LSD and cocaine. Drug screening results using immunological based enzyme linked immunosorbent assay (ELISA) testing indicate the presence of a drug group and is used to identify blood samples which are drug free. Identification and quantification of specific drugs proceeds on the remainder.

ANALYTICAL METHODS USED IN THE ANALYSIS OF BLOOD SAMPLES

1. Ethanol was determined in the bloods using gas chromatography with flame ionisation detection.
2. GHB was determined in the bloods using gas chromatography/mass spectrometry.
3. The blood samples were screened by ELISA for the following compounds:
   - Opioids (including morphine, codeine and dihydrocodeine)
   - Amphetamines (including methylamphetamine and MDMA)
   - Benzodiazepines (including alprazolam, bromazepam, clonazepam, diazepam, flunitrazepam, lorazepam, nitrazepam, nordiazepam, oxazepam, temazepam and triazolam)
   - Cannabinoids (THC and carboxy-tetrahydrocannabinol)
   - Cocaine (including cocaine and benzylecognine)
   - LSD

Samples with positive ELISA screening results were then confirmed and quantified by the following methods:

- Amphetamines: Extracted using liquid/liquid extraction and analysed by gas chromatography with nitrogen phosphorus detection. (Including amphetamine, chlorphentermine, diethylpropion, dimethylamphetamine (DMA), 2,5-dimethoxy-4-methylamphetamine (DOM), ephedrine, fenfluramine, ketamine, mephentermine, methylamphetamine, 3,4-methylenedioxyamphetamine (MDA), 3,4-methylenedioxymethamphetamine (MDMA, “ecstasy”), methylenedioxyethylamphetamine (MDEA), methylphenidate, paramethoxyamphetamine (PMA), pseudoephedrine, phentermine).
  Limit of detection for amphetamine, methylamphetamine, MDA, MDMA, MDEA and pseudoephedrine= 0.01 mg/L and for ketamine= 0.1mg/L.

[b] *The term “amphetamine” here refers to the class of drugs that includes the specific compounds: amphetamine, methamphetamine, MDMA (ecstasy), MDA, MDEA, PMA, ephedrine, pseudoephedrine.*

- Benzodiazepines: Extracted using liquid/liquid extraction and analysed by gas chromatography with electron capture detection and liquid chromatography/ mass spectrometry. (Including alprazolam, bromazepam, clobazam, clonazepam/7-aminoclonazepam, diazepam/nordiazepam, flunitrazepam/7-aminoflunitrazepam, lorazepam, midazolam, nitrazepam, oxazepam, temazepam and triazolam).
  Limit of detection:
  Alprazolam= 0.01mg/L
  Clonazepam/7-aminoclonazepam= 0.005 mg/L
  Diazepam/nordiazepam= 0.02mg/L
  Flunitrazepam= 0.002mg/L
  Midazolam= 0.02mg/L
  Nitrazepam= 0.002mg/L
  Oxazepam= 0.1mg.L
  Temazepam= 0.1mg/L

- Cannabinoids: Extracted using solid phase extraction and analysed by gas chromatography/ mass spectrometry. THC: Limit of detection= 1ng/mL. Cannabinoids are a group of compounds found in cannabis. THC is a cannabinoid and the major psychoactive constituent of cannabis. Blood THC concentrations reach a maximum a short time after cannabis use and then decrease rapidly. Low concentrations of THC (1-2ng/mL) may be detected for up to a day following cannabis use depending on dose and frequency of use. 11-nor-9-carboxy-THC is the major metabolite of THC in blood. It may be detected for several days after cannabis use. Depending upon the strength of the cannabis, peak THC concentrations can reach up to 200ng/mL within 15 mins of smoking. THC is then rapidly distributed to tissues resulting in a rapid decline in blood THC concentrations. Concentrations of THC greater than 10ng/mL are generally uncommon after 1 hour. It is not uncommon for regular users of cannabis to have concentrations greater than 1ng/mL 12 hours after use. It is generally accepted that levels less than 2ng/mL may not suggest recent use and may be from use days earlier[9].

- Opioids: Extracted using solid phase extraction and analysed by liquid chromatography/ mass spectrometry. (Including morphine, codeine and monoacetylmorphine).
  Limit of detection for morphine, codeine and monoacetylmorphine= 0.01mg/L

- Cocaine: Extracted using liquid/liquid extraction and analysed by liquid chromatography/ mass spectrometry.
  (Including cocaine and benzylecognine)
  Limit of detection= 0.01mg/L

- LSD: Extracted using liquid/liquid extraction and analysed by liquid chromatography/ mass spectrometry.
  Limit of detection= 0.001mg/L

4. The bloods were screened for the following common basic drugs using liquid/liquid extraction and analysed by gas chromatography with nitrogen phosphorus detection:

- Anticonvulsants: carbamazepine, lamotrigine

- Antidepressants: amitriptyline/nortriptyline, bupropion, citalopram, clomipramine, dothiepin, doxepin, fluoxetine, fluvoxamine, imipramine/desipramine, mianserin, mirtazepine, moclobemide, paroxetine, sertraline, trimipramine venlafaxine.
- Narcotic analgesics: codeine, dextromethorphan, dextromoramide, hydrocodone, methadone, oxycodone, pethidine, propoxyphene, tramadol.
- Antipsychotics/ tranquillisers: chlorpromazine, clozapine, olanzapine, pericyazine, promazine, promethazine, quetiapine, thioridazine.
- Antihistamines: brompheniramine, chlorpheniramine, doxylamine, diphenhydramine, pheniramine, promethazine,
- Miscellaneous: anabasine, benzocaine, benztropine, caffeine, chloroquin, ketamine, lignocaine, metaclopramide, nicotine, nifedipine, orphenadrine, pentazocine, procaine, quinidine, quinine, strychnine, verapamil, zolpidem.

Note: The majority of drugs in this list would be found at normal therapeutic concentrations. However, some may only be detected at greater than therapeutic levels.

PRIMARY DATA ANALYSES

On completion, data is entered into an Access Database program by the PRN. Patient identifiers (name, UR number, date of birth) are not entered into the database.

Outcome Measures:

The primary outcome measure of Phase 1 of D_2EWS was the proportion of eligible patients able to be successfully entered into the study. Using data from the review by the Hazardous Substances Section of the Environmental Health Service of South Australia on poisoning cases assessed at the RAH 2002[10], we estimated approximately 500 enrolments during the initial 6 month period. We estimated the relative proportions of each drug group to be approximately:

Table 1: Anticipated drug enrolments by proportion.

Drug Type	Relative Proportion (%)
Alcohol	75
Benzodiazepines	25
Cannabinoids	25
Opioids	10
Amphetamines	5
GHB	5

The broad primary outcome measures for the study period as a whole included:

- Timeliness to data collection and data entry;
- Quality and consistency of data collection;
- Ability to identify changing patterns in drug use and new compounds;
- The ability to correlate blood drug levels and clinical signs and symptoms; and,
- Timeliness to reporting of relevant findings.

ETHICAL CONSIDERATIONS

Informed Consent:

The nature of the Project is such that a requirement to obtain consent for enrolment would lead to the exclusion of a significant proportion of patients, thereby rendering the results much less meaningful. Informed consent would be unobtainable from a large number of patients for a variety of reasons, including (but not limited to) the effects of the drugs that are to be studied. In this setting, an explanation of the complex measures taken to ensure confidentiality is unlikely to be understood or accepted. The Principle Investigators of this project note that, in similar vein, many of the referenced, published, prospective trials examining the relationship between drug use and trauma did not appear to require informed consent for sample collection or analysis[11,12,13].

It is current standard practice that all patients presenting to the ED with notable medical conditions routinely have an intravenous cannula placed and blood drawn from that cannula at the time of its insertion. This is sent for various analyses as clinically indicated. In intoxicated or poisoned patients this is done on the basis of implied consent.

The National Statement on Ethical Conduct in Research Involving Humans (Commonwealth of Australia, 1999) states:

“It is ethically acceptable to conduct certain types of research without obtaining consent from participants in some circumstances, for example, the use of de-identified data in epidemiological research...”[14]. This is consistent with the study methodology, which has been designed to ensure patient anonymity.

Accordingly, for the reasons outlined above, specific informed consent for the sampling of blood, or for the testing of the blood sample for the specified drugs, is not sought.

The Royal Adelaide Hospital Ethics Committee gave ethics approval for the study.

GOVERNANCE

A Project Steering Committee (PSC), comprising RAH ED, FSSA and DASSA representatives oversees this project. It provides direction, monitors outcomes, and reviews progress. This committee has met approximately bi-monthly since the early development phase of the project.

Since commencement of the project, the PSC has had one complaint brought to its attention. This related to concerns over confidentiality of data results raised by an enrolled patient. These concerns were allayed after an explanation of the nature of the de-identification process and a guarantee of anonymity were given.

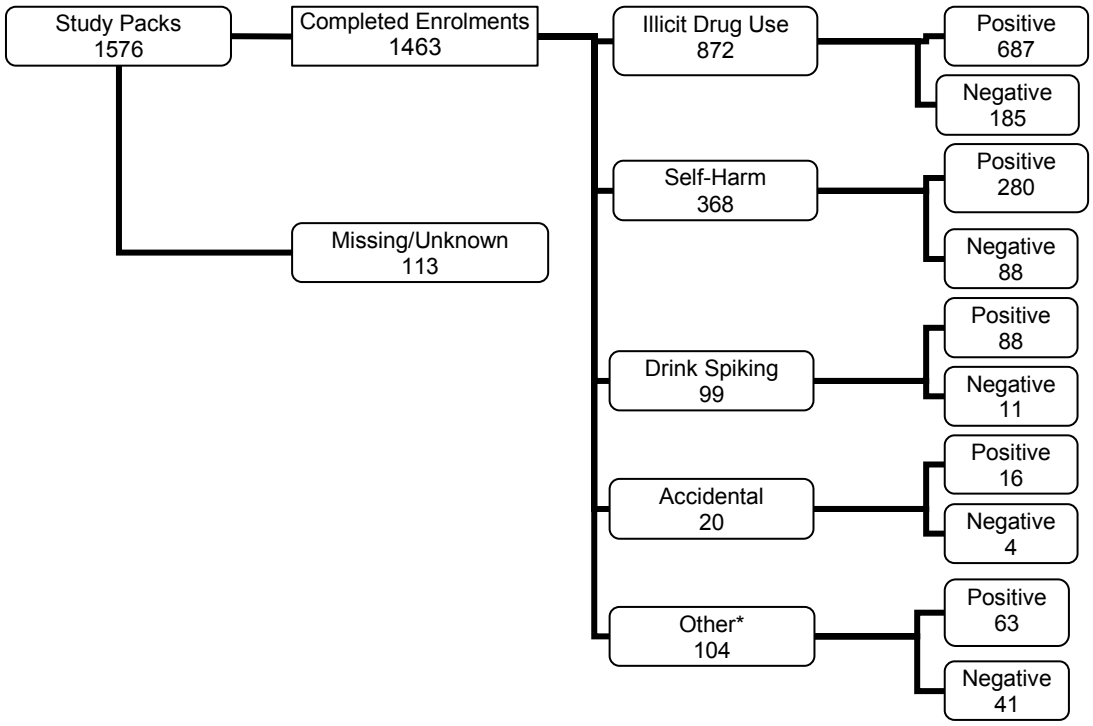
SECTION 3 RESULTS AND DISCUSSION

3.1 OVERVIEW AND COMBINED RESULTS

3.1.1 Enrolments

In the 12 months of the reporting period (August 2004 - July 2005), a total of 1576 study packs were used with 1463 enrolments completed (Figure 1). No data was returned for 113 of the study packs. As neither a blood sample nor indicative paperwork were returned the authors believe that these packs were discarded, opened in anticipation of enrolling a patient who later was felt not suitable for enrolment, or clinical circumstances did not allow for enrolment.

Figure 1: Enrolment figures for period August 2004 to July 2005.



(* Other = iatrogenic poisoning, those suspected of drug intoxication or poisoning but not classifiable, and unknown)

Precise determination of the number of eligible enrolments for the period is not possible. However, an estimation may be drawn using the ED diagnostic discharge codes (ICD-9s and ICD-10s) related to poisoning. Analysis of this data suggests an enrolment rate of approximately 80% for patients with a principal discharge diagnosis of poisoning due to substance use during the study period. This enrolment rate compares well with the pre-commencement projected total of 1000 enrolments per 12 month period. Of those enrolments whose data have been analysed, 1134 (77.5%) returned positive test results (Figures 1 & 2). This data suggests relatively good enrolment specificity. It should be noted that drug testing is obviously not performed on all ED attendances and that ED discharge diagnostic coding suffers from error rates and uncertainties. Therefore enrolment sensitivity estimation remains

imprecise. Figure 2 shows that in the first 3 months of the study enrolments were less specific; this most likely represents the learning curve of the establishment phase of the study.

Figure 2: Comparison of all enrolments each month and the number of enrolments testing positive for drugs.

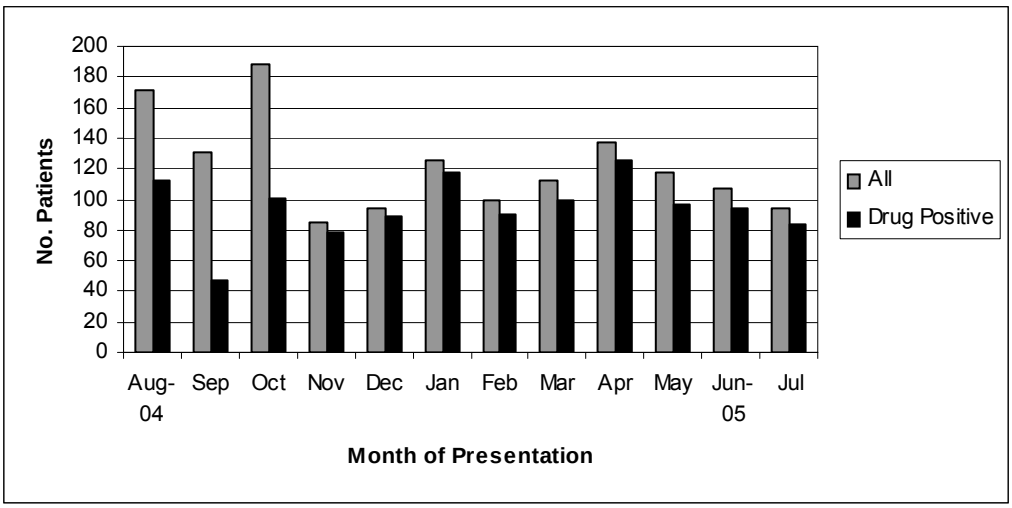
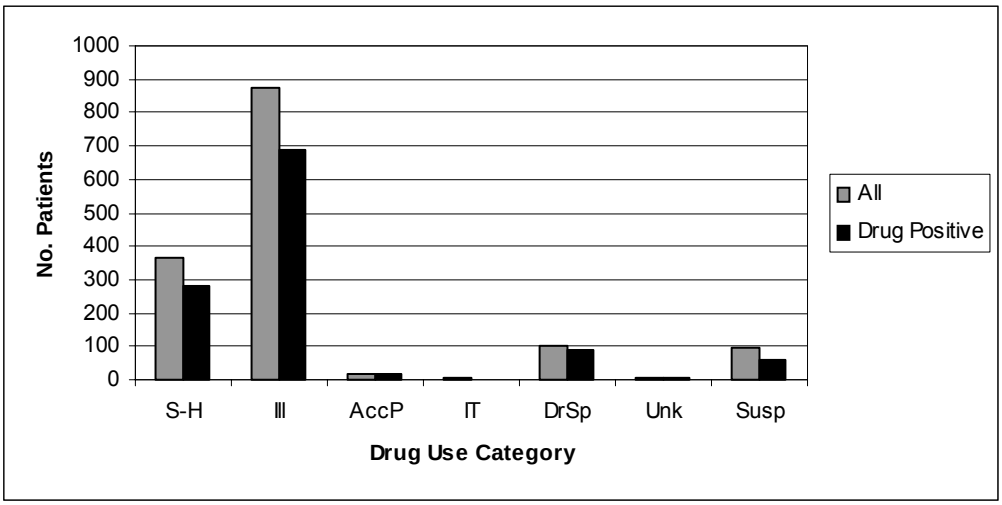


Figure 3: Number of patients testing positive for drugs compared to all enrolments in each drug use enrolment category.



(S-H = Self-Harm, Ill = Illicit Drug Use, AccP = Accidental Poisoning, IT = Iatrogenic Poisoning, DrSp = Drink Spiking, Unk = Unknown, Susp = Suspected intoxication)

The majority of drug positive enrolments (687 of 1134, 60%) were classified by the ED Medical staff to have been the result of Illicit Drug Use, followed by deliberate Self-Harm (280 of 1134, 25%), and Drink Spiking (88 of 1134, 8%)(Figure 3). The proportion of patients presenting intoxicated or poisoned as a result of alleged Drink Spiking was surprisingly high (see Section 3.2.3 “Drink Spiking”).

3.1.2 Demographic Details

Ethnicity:
The majority of drug positive patients enrolled have been Caucasian (89%, Table 2). The proportion of Indigenous patients testing positive for drugs (4.5% of positive enrolments) differs from other survey findings. For example, the 2004 SA PDI survey of regular ecstasy users reported no participants identified as Indigenous[15] and the 2004 IDRS survey of injecting drug users reported 14% of participants identified as Indigenous[16]. One explanation for this apparent discrepancy may be an increasing availability of options for management of clinically intoxicated Indigenous patients away from the hospital emergency department. Anecdotal reports suggest that services such as the Aboriginal Sobriety Group Mobile Assistance Patrol divert a significant proportion of apparently intoxicated Indigenous patients from the RAH ED to culture-specific services. Recent enactment of alcohol-free "dry zones" in the central city area may also have significantly impacted on the proportion of intoxicated Indigenous patients presenting to the RAH ED.

Table 2: Number of enrolled patients testing positive on drug screening according to ethnicity and gender.

Ethnicity	Positive Toxicology		Total
	Male	Female	
Caucasian	601	414	1015
Indigenous	36	15	51
Asian	14	5	19
African	1	0	1
Arab	5	0	5
Other	25	18	43
Total	682	452	1134

The proportion of Indigenous patients presenting as a result of Illicit Drug Use (40 of 51 drug positive patients, 78%) was much higher than that for Caucasian patients (608 of 1015, 60%).

Age and Gender:
The majority of positive enrolments (761 of 1134, 67%) have been between 18 and 35 years of age (Figure 4). However, a reasonable minority (70 of 1134, 6%) were less than 18 years of age, and 5% (62 of 1134) were over 50 years of age.

More male than female patients were enrolled (892 male, 571 female). The gender ratio of those testing positive was the same as the overall enrolment ratio (3 male to 2 female, Table 3) suggesting that the gender difference in enrolment is not likely due to selection bias, but represents true presentation rate differences between the genders. This is not surprising given that males account for 67% of all treatment episodes with both government funded and other treatment agencies in South Australia[17]. Of note is that this gender ratio of 3 to 2 extends across all age groups except for under 18 years of age where it is reversed (30 male to 40 female drug positive patients). In those over 74 years of age there was no gender difference demonstrated, however the numbers enrolled in this age group were too small to allow reliable comment.

Figure 4: Age distribution according to gender and drug testing result.

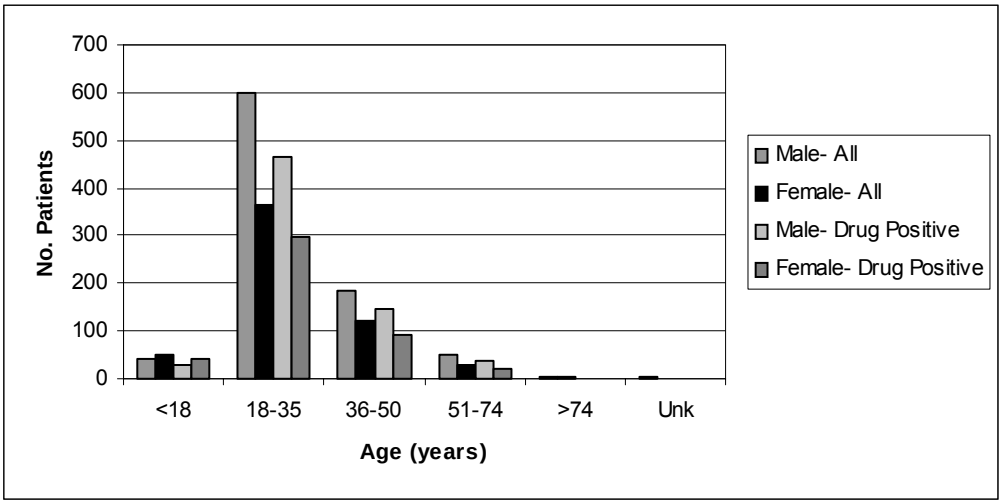


Table 3: Gender comparison between all enrolments and those testing positive for drugs across the age groups (numbers of patients).

Age	All Enrolments			Positive Toxicology		
	Male	Female	Total	Male	Female	Total
<18	42	52	94	30	40	70
18-35	605	355	960	464	297	761
36-50	186	132	318	145	94	239
51-74	52	29	81	39	19	58
>74	3	3	6	2	2	4
Unknown	4	0	4	2	0	2
Total (% of group total)	892 (61%)	571 (39%)	1463	682 (60%)	452 (40%)	1134

Variation in the gender ratios was seen between the groups divided according to the reason for drug exposure (presentation category, Table 4). In those patients in the Illicit Drug User group, the male to female ratio approached 5 to 2. This was reversed in both those intending deliberate Self-Harm (male: female approximately 3:4) and in those alleging Drink Spiking (male: female ratio approximately 1:2). In both the Accidental and Iatrogenic Poisoning groups there was no gender difference, however numbers again were very small. For those in whom drug intoxication was suspected as causing or contributing to the clinical condition but for whom a reason could not be reliably attributed ("Unknown & Suspected") the gender ratio closely matched that of the Illicit Drug User group.

Presentation Category:

As anticipated, intoxication or poisoning as a result of Illicit Drug Use constituted the largest proportion of presentations (61%), with attendances for Self-Harm the next most frequent (25%, Table 4). The proportion of patients presenting following alleged Drink Spiking though was unexpectedly high at just under 8% of all enrolments testing positive to drugs. The similar gender ratios, and similar patterns of the drugs detected suggest that most of the Unknown & Suspected group may have been due to illicit drug use.

Table 4: Gender comparison between presentation categories for drug-positive patients.

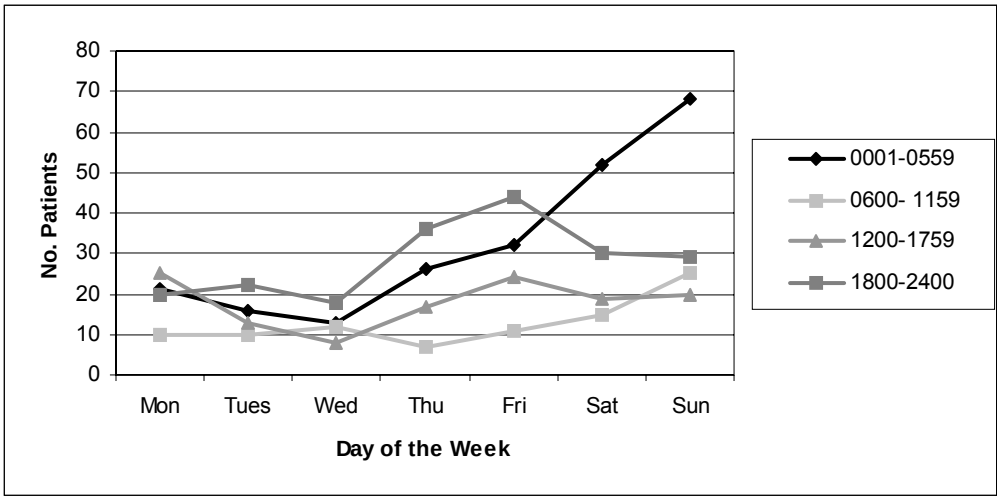
Presentation Category	Male (% of type)	Female (% of type)	Total (% of total)
Self-Harm	120 (43%)	160 (57%)	280 (25%)
Illicit Drug Use	484 (71%)	203 (29%)	687 (61%)
Accidental Poisoning	8 (50%)	8 (50%)	16 (< 1%)
Iatrogenic Poisoning	1 (50%)	1 (50%)	2 (<1%)
Drink Spiking	31 (35%)	57 (65%)	88 (8%)
Unknown & Suspected	44 (72%)	17 (28%)	61 (5%)
Total (% of total)	688 (61%)	446 (39%)	1134 (100%)

Time of Presentation:

This information is only available for Phase 2 of the study. It was a new point added following the Pilot phase (Phase 1).

Just over half of all enrolments testing positive to drugs during Phase 2 (323 of 643 (50.2%)) presented to the ED between the hours of 6 pm Friday and 6 am Monday (Figure 5). Two thirds of patients presented between the hours of 18:00 and 06:00 (427 of 643 (66.4%)). The most likely time of presentation was between the hours of midnight and 6am on Sunday morning (68 of 643 (10.6%)), followed by Saturday morning (8%) and Friday night (6.8%).

Figure 5: Day and time of presentation to the ED of patients testing positive to drugs.



(Data from Phase 2 of study only)

The highest number of drug-positive enrolments was seen during April 2005 (125 patients, Figure 2). More enrolments per month occurred in both August and October 2004 but the drug-positive rates were quite a bit lower (113 drug positive of 171 enrolments in August and 101 of 188 in October), again suggesting less discrimination in enrolment in the early phase of the study. Unlike the early data available at the time of the six-month Interim Report[18], these monthly figures do not suggest a seasonal variance in the overall presentation rates of intoxicated or poisoned patients to the ED.

Venue of Exposure and mode of transport to ED:
Location of drug use was recorded in 58% (654 of 1134 drug positive enrolments (Figure 6)). Of those for whom it was documented, 53% (345 of 654) used substances at home or another place of residence, and 28% (185 of 654) reported use at a licensed venue (public house, bar or night club).

Figure 6: Proportional representation of venue of drug exposure for all drug-positive enrolments.

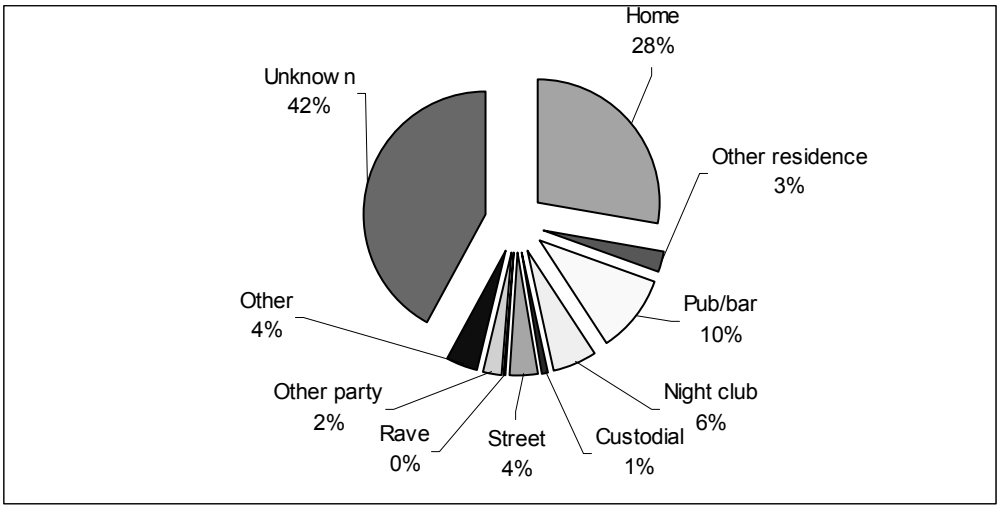


Table 5: Venue of drug exposure for each presentation-type.

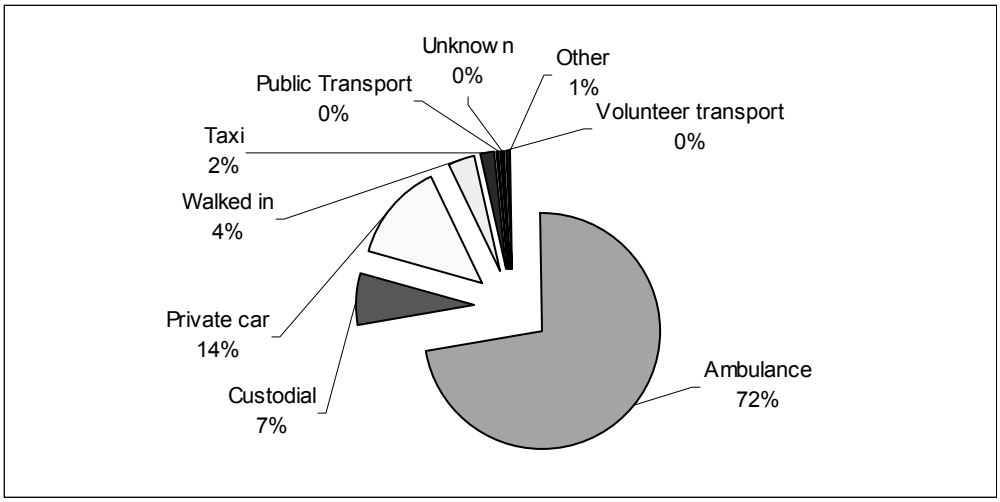
Venue	Self-Harm	Illicit Drug Use	Accid Pois	IT	Drink Sp	Susp	Total
Home	172	130	8	0	1	3	314
Other Residence	12	17	1	1	0	0	31
Pub/bar	5	83	1	0	28	0	117
Night club	1	52	0	0	15	0	68
Custodial	2	6	0	0	0	1	9
Street	4	35	1	0	1	1	42
Rave	0	3	0	0	0	0	3
Other party	0	21	0	0	3	0	24
Other	10	32	1	1	2	0	46
Unknown	74	308	4	2	38	56	480
Total							1134

(All drug-positive enrolments) (Accid Pois = Accidental Poisoning, IT = Iatrogenic Poisoning, Drink Sp = Drink Spiking, Susp = Suspected intoxication)

Of those patients testing positive to drugs during Phase 2, the vast majority (464 of 646, 72%; Figure 7) presented via the South Australian Ambulance Service (SAAS). It is of note that a minority (48 of 646, 7%) were brought to the ED by police, prisons or other custodial agencies. These transportation rates to the ED by SAAS or custodial services for poisoned and intoxicated patients contrasts with figures for overall ED attendances of whom 41% arrive by SAAS and 1.7% in police custody[19]. It is perhaps not surprising that the proportion of enrolled patients brought by police and custodial services is greater than overall attendances given the

illicit nature of most of the compounds and the fact that the reason for attendance often relates to behavioural issues in public places. It may also reflect a greater police presence where drugs are being taken. The proportion brought by SAAS compared to private or public transport though, is surprising. This might suggest that the seriousness of the enrolled patients' medical conditions at the time of presentation was, on average, more severe than the overall average of ED attendances. This is also supported by clinical data from the study to date (see Clinical Correlates and Table 15 showing triage category comparison all ED attendances versus drug-positive enrolments).

Figure 7: Proportional representation of mode of arrival to hospital.



(All drug-positive enrolments Phase 2 data only, n = 646)

It has been argued that, because of the illegal nature of many of these substances, drug takers might be reluctant to use ambulance services due to a perceived connection with policing agencies. In general terms, our data does not support this argument. SAAS policy was changed several years ago whereby police were notified of a narcotic overdose only if there were specific policing or security issues or if there was a fatality. Major efforts were made to educate the IV heroin-using population specifically in this matter, through the distribution of wallet resource cards, the clean needle programme and the Indigenous population on prison pre-release programmes[20]. Our data suggests that message may have translated to users of other substances.

3.1.3 Patterns of Drug Use

Of the 1463 enrolments for whom blood test results were available at the time of reporting, 1134 patients tested positive to over 63 different drugs with a total of 2405 positive drug tests returned (Appendix B).

The Main Drug Types:
Alcohol was clearly the most common drug detected, with 670 (59%) of the 1134 drug positive patients testing positive for alcohol. Diazepam or nordiazepam (the major metabolite of diazepam) was the next most frequently detected compound (308 of the 1134 patients, 27%), followed by cannabinoids (259 of 1134, 23%), methamphetamine (179 of 1134, 16%), and ecstasy (MDMA, 94 of 1134, 8%) (Table 6 and Appendix B).

Table 6: Number of positive drug tests for each major drug group and the percent of all positive drug results.

Drug Type	Number of patients testing positive* *n* = 1134 (%)	Number of positive drug results (% of total results)
Alcohol	670 (59)	670 (28)
Benzodiazepines	397 (35)	608 (25)
Amphetamines	247 (22)	341 (14)
THC	259 (23)	259 (11)
Opioids	149 (13)	189 (8)
GHB	36 (3)	36 (2)
Ketamine	6 (<1)	6 (<1)
Cocaine	8 (<1)	8 (<1)
LSD	5 (<1)	5 (<1)
Antidepressants	130 (12)	140 (6)
Antipsychotics	33 (3)	35 (2)
Others	92 (8)	108 (4)
Total number of positive drug results		2308

(*Total is greater than the total number of patients testing positive to drugs (1134 patients, Fig. 1) as many tested positive to more than 1 compound)

Although, as a group, benzodiazepines[c] were the most commonly detected compounds (608 of 2405 positive results (approx. 25%), see Table 6), tests positive for both the metabolites as well as the ingested parent compound in the same patient account for many of these. A total of 397 patients tested positive for benzodiazepine compounds. (See Section 3.3.3. "Benzodiazepines"). The number of patients testing positive to THC or to one of the amphetamine group[d] was similar at 259 and 247 patients respectively, and 149 patients tested positive to opioids[e]. Tabulation of drug use revealed that most alcohol, THC, and amphetamine use was associated with Illicit Drug Use, whilst most benzodiazepine and other prescription drug use were associated with Self-Harm (Appendix B).

The proportion of patients testing positive for amphetamines was particularly high. The rise in amphetamine use and a concomitant fall in heroin use in recent years has been well described[21,22]. However, our data, showing just under twice the number of patients positive for amphetamines compared to opioids (247 of 1134 patients (22%) vs. 149 of 1134 patients (13%)) shows a greater difference than that reported elsewhere among IDU[16,23], and is the reverse of our pre-commencement predictions. It is possible that our data reflects not only a real rise in psycho-stimulant use but also a greater likelihood that psycho-stimulant users might present to an Emergency Department for assessment and management. It might be argued that recent education programs targeting injecting opiate users[20] and police and paramedic policy adjustments have resulted in a significant proportion of opiate overdose patients being successfully managed at the scene of drug use (with naloxone) without the need for transport to hospital. On the other hand, the clinical adverse effects of psycho-stimulant

[c] *benzodiazepines tested = diazepam, temazepam, nordiazepam, clonazepam, oxazepam, alprazolam, nitrazepam, amino-nitrazepam, lorazepam, bromazepam, triazolam, flunitrazepam*
[d] *amphetamines = amphetamine, methamphetamine, MDMA, MDA, MDEA, ephedrine, pseudoephedrine*
[e] *opioids = heroin, methadone, morphine, codeine, oxycontin, dextropropoxyphene*

use (tendency to agitated and violent behaviour, psychosis, hyperthermic syndromes) are not so easily managed outside of the ED. This point is also relevant when comparing the numbers of patients testing positive to the amphetamine group and those testing positive to THC. Although the numbers were similar this likely represents the higher risk of a short term adverse medical event with amphetamine intoxication rather than an accurate reflection of the comparative community incidence of use (see also Section 3.3.4. “THC”).

Methamphetamine was the most commonly detected of the amphetamine group (179 cases (52% of positive psycho-stimulant drug tests)) followed by MDMA (94 cases (27% of positive psycho-stimulant drug tests)). The vast majority of amphetamines were detected in Illicit Drug Users (191 of the 687 patients in the Illicit Drug User group (28%)), however a similar proportion of amphetamine use was also seen in the alleged Drink Spiking group (21 of 88 patients (24%)) (Section 3.3.2. “Amphetamines”, Table 110).

Excluding codeine, the most common opiate detected was morphine (56 cases, 30% of positive opiate drug tests), followed by methadone (42 cases, 22% of positive opiate drug tests). Only 4 patients tested positive to heroin. This is in marked contrast to the proportional use and availability of these drugs reported elsewhere[24]. This also contrasts with a rise in the number of RAH ED patients with a discharge diagnosis of heroin overdose over this period.

The number of patients discharged from the RAH ED with a diagnosis of heroin related toxicity has fallen from approximately 220 in 1999 to stabilise at about 30 per annum from 2002 to 2004[10,22] (Table 7). In the first half of 2005 the rate of heroin attributed presentations suddenly doubled and then doubled again in August 2005, leading to the publication of an alert (see Appendix B). It should be noted that, due to its rapid metabolism, intravenous heroin use more than 6 hours prior to blood sampling may test positive only to morphine[25]. Therefore, it is probable that heroin was the parent compound in a number of the patients testing positive to morphine. However, even assuming heroin was the drug used in the maximum number of cases testing positive to morphine it is clear that diversion of prescription opioids is a very disturbing problem, constituting at least 50% of opiate related presentations (See discussion Section 3.3.5. “Opioids”).

Table 7: Number of patients at RAH ED with discharge diagnosis of heroin related toxicity.

Year/Month		Number of Patients
1999 – 2000		221
2000 – 2001		121
2001 – 2002		30
2002 – 2003		38
2003 – 2004		25
2004 – 2005		30
2005	March/April	6
	May/June	7
	July/August	14

There were a total of 283 positive tests for prescription drugs other than benzodiazepines or opioids. Of these the large majority were either antidepressants (130 patients with 140 tests

positive for antidepressants) or antipsychotics (33 patients with 35 tests positive for antipsychotics). The large majority (28 of 33 patients, 85%) of presentations testing positive for an antipsychotic were the result of deliberate Self-Harm. However, a surprisingly high proportion of patients testing positive for antidepressants presented other than with deliberate Self-Harm, with nearly 28% (36 of 130 patients) presenting as a result of Illicit Drug Use (Table 210, Section 3.3.10. Antidepressants and Antipsychotics). It has been suggested[26] that the specific combination of antidepressants or antipsychotics with the psycho-stimulants in Illicit Drug Use has been a recent trend, particularly in the ecstasy and related drugs scene. In one series, 2.8% of males and 4.1% of females using amphetamines also used antidepressants[26]. This appears to be supported by our data which shows that of the 247 patients testing positive to amphetamines, there were 71 results positive for antipsychotic drugs, antidepressant drugs, or benzodiazepines[f]. Combined with the high incidence of positive results for the opioids morphine and methadone, this data likely represents a high rate of diversion of prescribed drugs for illicit purposes.

Of the other frequently mentioned drugs of abuse, there were 36 cases of GHB, 8 cases positive for cocaine, 6 for ketamine, and 5 for LSD (see Section 3.3. per drug type).

A surprisingly high number of samples tested positive to lignocaine, an injectable local anaesthetic and cardiac drug. There appears to be no specific correlation with the other drugs or with a particular presentation category. It is therefore most likely that these are the result of local skin infiltration prior to venous cannulation for blood sampling by the ED medical staff, and do not represent a contaminant of the drugs of abuse or abuse of lignocaine.

The relative rates of detection of the major drugs of interest differ markedly from our pre-study estimates (see Outcome Measures,). For example, the detection rate of 22% for all patients testing positive to an amphetamine is much higher than the pre-study estimate of 5%, and although the detection rate for THC was similar to our estimate, the fact that it was detected as frequently as amphetamines, and less frequently than benzodiazepines, is surprising. These initial estimations were calculated in late 2003 and based on data from the previous 12 months. Although an indirect measure, this data might suggest that, in just the space of 3 years there has been a change in the broader pattern of drug use of patients presenting intoxicated to the ED.

Poly-substance abuse:
Poly-substance abuse is a feature of our results; the majority of patients testing positive to a drug of abuse were positive for multiple substances. Only 42% of patients tested positive to a single drug (476 of 1134, Table 8), and most of these were alcohol. Poly-substance abuse was proportionally greatest in the Self-Harm group with 67% testing positive to more than 1 drug and 12.5% to more than 3 drugs. This compares with 59% and 6% respectively in the Illicit Drug User group. The most common combinations of drugs were alcohol with cannabinoids among Illicit Drug Users and alcohol with benzodiazepines in the Self-Harm subgroup. The frequency with which additional specific drugs were found for each major drug of interest is tabulated in Section 3.3., results by drug type.

[f] *Benzodiazepines are formally classified as sedative hypnotics, not antidepressants, however they are most frequently prescribed in the setting of depression.*

Table 8: Number of patients in each presentation category testing positive for 1 or more different drugs.

Number of Drugs	Self-Harm (%)	Illicit Drug Use (%)	Drink Spiking (%)	Other* (%)	Total (%)
1	92 (33)	282 (41)	61 (69)	41 (52)	476 (42)
2	104 (37)	221 (32)	22 (25)	19 (24)	366 (32)
3	49 (17.5)	141 (20)	4 (5)	11(14)	205 (18)
>3	35 (12.5)	43(6)	1 (1)	8 (10)	87 (8)
Total	280	687	88	79	1134

(% = percent of presentation category). (*Other: Accidental Poisoning, Iatrogenic Toxicity, Unknown/Suspected combined)

Up to 7 different substances were detected in the one patient. Some relevant case demographic and clinical details are described in Table 9. Despite the multiple substances present (Table 10) this patient had a normal conscious level (Glasgow Coma Score (GCS) 15)[g] and remained in the ED for only 11 hours before transfer to a specialist psychiatric unit. Apart from the large number of substances detected this case is typical of many of the examples of poly-substance abuse identified.

Table 9: Features of a case of poly-substance abuse (see text).

Age/ Gender/Ethnicity	36 to 50 years/female/Caucasian
Arrival	By Ambulance
	@ 1800 – 2400 hours
Triage priority	4
Presentation classification	Illicit Drug Use
Recent reported drug use	IV amphetamine – amount unknown
	Oral diazepam – 3 tablets (dose unknown)
	Alcohol – amount unknown
Past history	Alcohol abuse
	Bipolar affective disorder
Treatment required	Chemical sedation (benzodiazepine)
	Intravenous rehydration
Disposition	Transfer to psychiatric unit after observation in ED

[g] *The Glasgow Coma Score is a standardised scoring system for quantifying the level of unconsciousness. Examination of 3 clinical components produces scores ranging from 3 to 15. A score of less than 9 is generally accepted as severe, often requiring emergency medical supportive intervention. Scores of 9 to 12 might be considered moderately affected, whilst above 12 mildly affected. 15 is normal.*

Table 10: Drugs detected and the blood levels in a single case of poly-substance abuse (see text).

Drug Type	Level
Alcohol	0.02 g/100mL
Amphetamine*	0.01mg/L
Diazepam	0.11
Methamphetamine	0.02 mg/L
Morphine*	0.01
Codeine	0.24
Nordiazepam*	0.04
Oxazepam	0.2
THC	1µg/L

(*metabolites)

3.1.4 Clinical Correlates[h]

Clinical suspicion of drug used:

A comparison of what the enrolling clinician suspected had been taken and what was actually detected in the blood tests is shown in Table 11. In general, the indication or suspicion that a specific drug was taken was derived from what the patient or accompanying friend or relative stated the patient had used, rather than from specific clinical signs or symptoms. The data shows there is a very real difference between rates of reporting or suspicion of use and the rates of detection of several drugs. In the setting of Illicit Drug Use, this might support the contention that a number of drug users do not know what drug they are using. As discussed elsewhere however, the large discrepancy between suspected heroin use and rates of detection may, in part, be due to the fast metabolism of heroin to morphine[22]. In the case of methamphetamine and amphetamine it is possible that clinicians have recorded, and patients reported, suspicion of amphetamine use, meaning the broad class of drug, rather than defining the specific drug within the class. It may also highlight a lack of knowledge among medical staff, of the differences between the amphetamine substances. Interestingly, there is relatively close correlation between what was reported as being taken and what was detected for both GHB and MDMA, which may reflect the special interest taken in that drug by the Department and of past experience.

[h] *The clinical effects of drugs of abuse are extremely varied and complex. However, some broad generalizations can be made. Most drugs are abused because of their effects on mood and conscious state. These effects may be classified as either central nervous system (CNS) depressants or stimulants. Those drugs that are abused for their stimulant or mood elevating effects (eg amphetamines) generally cause CNS depression as intoxication progresses to severe toxicity.*

Table 11: The number of patients suspected of taking the drug by the treating clinician, compared to the actual number of positive blood tests for the drug.

Drug Type	Number of patients suspected of using the drug	Number of positive blood tests for the drug
Alcohol	672	670
THC	130	259
Amphetamines (Class)		
Amphetamine	126	51
Methamphetamine	49	179
MDMA	79	94
Pseudoephedrine	3	10
Opioids (Class)		
Methadone	21	42
Heroin	37	4
Morphine	31	56
Codeine	7	80
Cocaine/benzylecognine	9	8
GHB	29	36
LSD	7	5
Ketamine	9	6

Past History:

There were 940 data entries specific to chronic medical or psychiatric illness. Of these nearly 60% were psychiatric in nature compared to only 11% being general medical or conditions (Table 12).

Not unexpectedly, the large majority of patients with an established past history of attempted suicide or a diagnosis of depression presented as a result of deliberate Self-Harm. However, surprisingly, the majority of patients with a past history of a major psychotic illness (for example schizophrenia) presented as a result of Illicit Drug Use (Table 13). The data fits well with current research into drug use and mental illness identifying the large majority of in-patients of psychiatric units as having a drug problem and approximately 75% of those with a drug problem also having psychiatric issues. This is especially the case in those with a psychotic illness like schizophrenia[27]. Although this data does little to clarify the question of whether illicit drug use leads to mental illness or alternatively, whether mental illness lends itself to drug abuse, it does highlight the problem of drug use amongst mental health patients.

Table 12: Incidence of past history of psychiatric, drug abuse/dependency, and general medical or surgical illness in drug-positive enrolled patients.

Recorded Past Medical/Psychiatric Illness	Number of Patients (%)
Psychiatric Illness	544 (58)
Drug abuse or dependency	292 (31)
Other Significant Chronic Medical	104 (11)
Total number of recorded entries*	940 (100)

(*n = 635 Patients may have had more than one medical or psychiatric condition, and data was not recorded for all drug-positive patients)

Table 13: Incidence of past psychiatric diagnoses recorded for drug-positive enrolments.

Past Psychiatric History	Self-Harm	Illicit Drug Use	Other	Total
Schizophrenia	13	31	2	46
Paranoid Schizophrenia	4	3	1	8
Bi-Polar Affective Disorder	17	20	2	39
Psychotic Episode	13	30	3	46
Schizoaffective Disorder	1	3	2	6
Depression	104	65	11	180
Anxiety	19	26	5	50
Self-Harming	29	14	1	44
Suicide risk/ attempt	28	12	3	43
Personality Disorder	29	28	3	60
Other	8	12	2	22
Total	265	244	35	544

(Patients may have had more than one psychiatric condition, and data was not recorded for all drug-positive patients)

Table 14: Incidence of past drug abuse diagnoses recorded for drug-positive enrolments.

Past Drug Abuse Diagnosis	Self-Harm	Illicit Drug Use	Other	Total
Alcohol Abuse	34	81	2	117
Poly-substance abuse	21	61	4	86
Opiate dependence/abuse	7	46	4	57
Chronic THC use		3		3
Benzodiazepine abuse	12	7		19
GHB abuse		2		2
Antidepressant abuse	8			8
Total	82	200	10	292

(Patients may have had more than one condition, and data was not recorded for all drug-positive patients)

An established past history of drug abuse was reported in 292 patients (Table 14). There were 130 patients documented as having an established past history of injecting drug use. Of these 6 were known to be Hepatitis B positive, 55 Hepatitis C positive and 3 HIV positive.

Triage Category[i]*:*

A comparison of the relative proportions of patients in each of the triage categories of those enrolled in the study to those of all ED attendances is shown in Table 15. Over half of drug-positive enrolled patients were determined to require either immediate management or

[i] *Triage is a clinical assessment tool that classifies patients at initial presentation according to their urgency for medical care. Although, as such, it is not a direct measure of illness severity, there is usually a strong correlation. This assessment is made on arrival and prior to consideration of enrolment into D_2EWS.*

management within 10 minutes of arrival (triage priority 1 and 2 respectively)[28]. This compares with only 23% for ED attendances generally during the same period.

From Table 16 it can be seen that the distribution across the triage categories of drug-positive enrolments broadly carries through to each of the major drug types examined. The notable exceptions are GHB and LSD. In the case of GHB nearly 70% of cases were so unwell they were given a triage priority 1, and 95% warranted either priority 1 or 2. All cases of LSD detected required a triage priority rating of 2, although the total numbers were small.

Table 15: Comparison of the triage priority distribution of all patients attending the RAH ED and enrolled patients testing positive to drugs or alcohol.

Triage Priority	All ED attendances: Number of Patients	Drug positive enrolments: Number of Patients
1	1797 (3%)	188 (17%)
2	11507 (20%)	397 (35%))
3	21518 (38%)	411 (36%)
4	18034 (32%)	127 (11%)
5	4385 (8%)	11 (1%)

Table 16: Triage priority of patients testing positive to each of the major drug types.

Drug Type	Triage Priority					Total Patients
	1	2	3	4	5	
Alcohol (%)	111 (17)	234 (34)	229 (35)	88 (13)	8 (1)	670
Benzos (%)	61 (15)	137 (34)	164 (41)	30 (8)	5 (1)	397
THC (%)	38 (15)	102 (39)	81 (32)	34 (13)	4 (1)	259
Amphetamines (%)	40 (16)	94 (38)	92 (38)	18 (7)	3 (1)	247
Opioids (%)	30 (20)	47 (31)	59 (40)	13 (8)	0	149
GHB(%)	25 (69)	9 (26)	2 (5)	0	0	36
Cocaine (%)	1 (21)	3 (38)	4 (40)	0	0	8
Ketamine (%)	1 (17)	2 (33)	2 (33)	1 (17)	0	6
LSD (%)	0	5 (100)	0	0	0	5
Antipsychotics (%)	6 (18)	13 (40)	12 (36)	2 (6)	0	33
Antidepressants (%)	30 (23)	38 (29)	51 (39)	11 (9)	0	130

(Number of patients and percent (%) of patients testing positive for that drug type)

The proportion of patients with a triage priority of 1 was much less than the average in both the Drink Spiking and accidental poisoning groups (Table 17).

Table 17: Comparison of number of patients in each triage category for each presentation category.

Presentation Category	Triage Priority					Total Patients
	1	2	3	4	5	
Illicit Drug Use	123	234	229	92	9	693
(%)	(18)	(34)	(33)	(13)	(1)	
Self-Harm	40	99	133	8	0	280
(%)	(14)	(35)	(48)	(3)		
Drink Spiking	7	26	35	19	1	88
(%)	(8)	(30)	(39)	(22)	(1)	
Accidental Poisoning	1	6	7	2	0	16
(%)	(6)	(37)	(44)	(13)		
Iatrogenic	1	0	0	1	0	2
(%)	(50)			(50)		
Other	16	32	7	5	1	61
(%)	(27)	(53)	(11)	(8)	(1)	
Total	188	397	411	127	11	1134
(%)	(17)	(35)	(36)	(11)	(1)	

Clinical Vital Signs:

An altered heart rate was the most frequently encountered abnormal clinical vital sign. Approximately 4% of patients had bradycardia (heart rate < 60 beats per minute (bpm)), whilst nearly 30% had a tachycardia (heart rate > 100 bpm); nearly 1% had rates in excess of 150 bpm. An electrocardiograph (ECG) was performed in 537 patients and was abnormal in 32% of cases (Table 18). A systolic blood pressure of less than 90mmHg (implying a shocked state) was recorded in 3% of patients.

Table 18: ECG heart rhythm results.

ECG Rhythm	Number of Patients (%)
Normal Sinus Rhythm	367 (68)
Sinus Bradycardia	9 (2)
Sinus Tachycardia	153 (28)
Supraventricular Tachycardia	2 (0.5)
Atrial Fibrillation	4 (1)
Asystole	1 (0.2)
Junctional	1 (0.2)
Total	537

(ECG data not recorded for all enrolled patients)

Body temperature was abnormal in almost a quarter of patients in whom it was recorded (125 of 517 patients during phase 2 of the study) with 20% of patients noted to be hypothermic (temperature < 35ºC) and 4% hyperthermic (temperature > 37.5ºC).

Parameters of respiratory function measured included: respiratory rate (RR), presence of abnormal breath sounds on auscultation, and arterial oxygen saturation (SaO_2). A degree of hypoxia ($SaO_2 \leq 95\%$) was seen in 9% (80 of 882 patients) of patients, and severe hypoxia

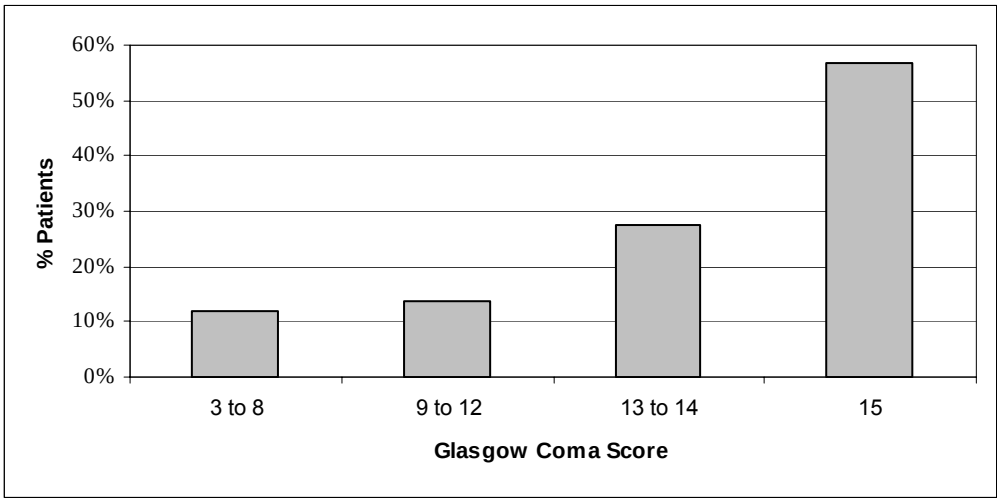
(SaO_2 ≤ 90%) was seen in 2% (18 of 882 patients). An abnormal RR (< 10 or > 20 breaths per minute) was seen in 17%. Abnormal breathing sounds were infrequently detected.

Of the 1129 patients in whom it was recorded, 217 (19%) had a moderate to severely decreased conscious level with a GCS of 12 or less at the time of presentation to the RAH ED (Figure 8). Of these, 101 (9%) had a severely depressed conscious state (GCS ≤ 8), including 28 patients (2.5%) who were completely unresponsive (the lowest possible GCS score of 3).

The drug most commonly detected in patients with a GCS of 8 or less was alcohol either alone or in combination with others. However, GHB was overwhelmingly the drug most likely to cause severe depression of conscious state. Of the 36 patients in whom GHB was detected 31 (86%) had a GCS of 12 or less. Of these 21 had scores ≤ 8, with 7 (19% of GHB cases) recording a GCS of 3. Only 3 patients testing positive to GHB had a normal GCS (see Section 3.3.6. Gamma Hydroxy Butyrate, Figure 42).

The gag reflex was recorded as diminished in 60 patients and absent in another 27 of the 1009 patients in whom the data was collected. Essential in protecting the airway from aspiration, depression of this reflex is indicative of high risk in the setting of poisoning or intoxication, and is typically associated with depressed conscious levels.

Figure 8: Conscious levels of patients as measured by the Glasgow Coma Score. (GCS): 3 to 8 (severe), 9 to 12 (moderate), 13 to 14 (mild), 15 (normal).



Of the other neurological clinical indicators recorded: seizure activity was seen in nearly 3% of patients (Table 19); depressed or absent deep tendon reflexes were noted in over 4%; nystagmus was present in 2%; and abnormal pupillary reaction to light was seen in 17% of patients.

Table 19: Number of patients in each presentation category recorded as having seizure activity.

Seizure Activity	Illicit Drug Use	Self-Harm	Accid Pois	IT	Drink Sp	Unk/Susp	Total (%)
Nil	596	247	15	2	81	47	988(87)
Myoclonus	3	2	1				6 (0.5)
Focal	1					1	2 (0.2)
Single Grand Mal	14	1			2		17 (1.5)
Multiple Grand Mal	4					2	6 (0.5)
Unknown	65	30			5	15	115 (10)
Total							1134

(Accid Pois = Accidental Poisoning, IT = Iatrogenic Poisoning, Drink Sp = Drink Spiking, Unk = Unknown Susp = Suspected intoxication)

Altered Mental State:

The rate of psychosis and agitated delirium[j] recorded in enrolled patients was surprisingly high at 11.4% (129 of 1134 patients, Table 20). Proportionally, rates were higher in the Illicit Drug Use group (13%) than in the Self-Harm group (8%). A total of 253 positive drug tests were returned on these 129 patients, again indicating rampant poly-substance use. There were only 16 tests positive for antipsychotic medication in this group. This may reflect either a high level of prescribed medication non-compliance with amongst patients acutely unwell with an established diagnosis of a psychotic illness, or alternatively perhaps, high levels of acute drug induced psychosis.

Table 20: Number of patients in each presentation category recorded as suffering acute psychosis or agitated delirium at presentation.

Psychosis/ Delirium	Illicit Drug Use	Self-Harm	Drink Spiking	Unk/Susp	Other	Total(%)
No	572	237	76	31	16	932 (82)
Yes	77	20	9	21	2	129 (12)
Unknown	34	23	3	13		73 (6)
Total						1134

(Unk = Unknown, Susp = Suspected intoxication)

Benzodiazepines were the most common drug detected in psychotic patients, followed by alcohol, amphetamines (as a group), THC, and opioids (Table 21). However, as a proportion of the total number of positive test results for each drug overall (Table 21, column 3) it can be seen that there appears to be a strong correlation between acute psychosis and agitated delirium and amphetamine use.

[j] *At the time of presentation, and often early in the ED attendance when enrolment for D_2EWS is considered, it is difficult to distinguish between a primary psychotic disorder, a drug induced psychosis, and an agitated delirium. For this reason enrolling clinicians were not asked to try and distinguish between them at the time of enrolment.*

Table 21: Rate of detection of the most common drugs found in patients suffering acute psychosis or agitated delirium at presentation, and proportional representation to overall detection rate for that drug.

Drug detected	No. of psychotic patients positive (%)* *n* = 129	No. of patients positive overall	Drug type psychosis rate %
Alcohol	59 (46)	670	9
THC	46 (36)	259	18
Amphetamines (Class)			
Methamphetamine	31 (24)	179	17
Amphetamine	12 (9)	51	24
MDMA	6 (5)	94	6
Opioids (Class)			
Methadone	3 (2)	42	7
Morphine	4 (3)	56	7
Codeine	4 (3)	80	5
GHB	2 (1)	36	6
Benzodiazepine	60 (47)	397	15

(*The percent of the 129 drug-positive psychotic patients)

Disposition from the Emergency Department:

The rate of admission to hospital for those testing positive for drugs was high at 50% when compared to the overall ED admission rate of approximately 36%. The highest admission rate (206 of 280 patients, 74%) was seen in the Self-Harm sub-group (Table 22). Despite less than 1% of patients being admitted directly to a psychiatric unit from the ED it is likely that a large proportion of patients, particularly in the Self-Harm group, were admitted for psychiatric assessment following a brief period of treatment or monitoring of the medical adverse effects of the drug(s); psychiatric assessment cannot, in general, be performed whilst the patient is intoxicated. Table 23 shows that 5% of patients were eventually discharged from the RAH to specialist psychiatric inpatient units.

Table 22: Immediate destination of drug positive patients after leaving the ED.

Disposition from ED	Illicit Drug Use	Self-Harm	Drink Spiking	Unknown/ Suspected	Other	Total (%)
Discharged	393	69	75	19	12	568 (50)
Admitted						
EECU	152	114	9	14	4	293 (26)
General Ward	68	41	2	4	-	115 (10)
ICU/HDU	47	42	2	14	1	106 (9)
Spinal	-	1	-	-	-	1 (<1)
Burns	-	-	-	1	-	1 (<1)
Cardiology	3	1	-	-	-	4 (<1)
Psych. Ward	6	-	-	3	-	9 (1)
Transferred	14	7	-	4	1	26 (2)
Unknown	4	5	-	2	-	11 (1)

(EECU = Emergency Extended Care Unit, ICU/HDU = Intensive care Unit/High Dependency Unit, Psych Ward = specialist psychiatric unit, transferred = care transferred to another health facility)

Of those patients admitted to hospital, the majority (52%) were admitted to the Emergency Extended Care Unit (EECU) attached to the ED. This unit functions as a short term observation unit for clinically stable patients expected to be discharged to home within 24 hours.

Ultimately, 85% of patients were discharged from hospital to home, and 92% of these had a length of stay of 24 hours or less[k]. Fourteen patients had a length of stay (LOS) in hospital of greater than 7 days. Of concern is the fact that a large number of patients (66 of the 568 admitted patients (12%)) left hospital against medical advice or absconded (Table 23), predominantly from the Illicit Drug User sub-group.

Table 23: Ultimate destination of patients at time of leaving the hospital.

Disposition from Hospital	Illicit Drug Use	Self-Harm	Drink Spiking	Unknown/ Suspected	Other	Total (%)
Home	584	237	86	40	16	963 (85)
Absconded	52	9	2	3	-	66 (6)
Psych services	24	27	-	8	2	61 (5)
SAPOL custody	13	-	-	2	-	15 (1)
Rehabilitation	7	1	-	3	-	11 (1)
Died	2	1	-	3	-	6 (0.5)
Other hospital	1	-	-	-	-	1 (<1)
Other/Unknown	4	5	-	2	-	11 (1)

(Psych services = specialist psychiatric unit, SAPOL = South Australian Police)

A total of 106 (almost 9% of patients required admission to Intensive Care (ICU) or the High Dependency Units (HDU). Of these, 61 patients (58%) required airway intubation for ventilatory

[k] *Need for admission to hospital (disposition from ED) and hospital length of stay (LOS) are indirect markers of severity of illness, as well as indirect markers of the duration of adverse effect of drug intoxication/poisoning.*

support or airway protection. There were 6 deaths recorded (see below) and 11 patients remained in rehabilitation facilities at the time of file closure. This represents an overall mortality rate of 0.5% and a major long-term adverse outcome rate (excluding death) of approximately 1% (Table 23). These cases were predominantly from the Illicit Drug Use category.

Fatalities:
There were 8 fatalities amongst all D_2EWS enrolments for the 12 month period, of which 6 tested positive for drugs. The following data relates only to those testing positive.

All were Caucasian and were evenly divided according to gender. All but 1 were 35 years of age or less, with 3 aged less than 18 years (Table 24). Drug exposure occurred at the patient's home in 3 cases and was unknown in the other 3.

Table 24: Gender and ages of fatalities.

Age (years)	Male	Female
<18	1	2
18-35	2	
36-50		
51-74		1
Total	3	3

At the time of enrolment 1 case was recorded as the result of deliberate Self-Harm, 2 were classified as a result of Illicit Drug Use, and 3 were classified as suspected drug abuse ("Suspected"). On subsequent review of the cases all 3 of the "Suspected" cases tested positive and were the result of deliberate Self-Harm; all died as a result of lack of oxygen to the brain secondary to hanging. All 3 of these cases tested positive to THC, with drug levels ranging from a moderate 3µg/L to a very high 20µg/L; this latter case also tested positive to ketamine at non-toxic levels (Table 25).

Table 25: Demographic and drug details of fatalities.

Case	Gender	Age	Nature of Drug Use	Venue	Drug	Level
1	male	< 18	Self-Harm	Home	THC	3µg/L
2	male	18 – 35	Illicit Drug Use	Unknown	Heroin	positive
					Codeine	0.2
					Morphine	0.4
3	female	51 – 74	Illicit Drug Use	Unknown	THC	3µg/L
					Methamphetamine	0.35mg/L
4	female	< 18	Self-Harm	Unknown	THC	20µg/L
					Ketamine	2
5	male	18 – 35	Self-Harm	Home	Codeine	0.12
6	female	< 18	Self-Harm	Home	THC	5µg/L
					Temazepam	0.1

The fourth case of deliberate Self-Harm tested positive only to codeine and paracetamol. This is despite admitting a past history of multiple drug usage, including MDMA, GHB, amphetamines, and alcohol, The patient had ingested other toxic chemical substances and pharmaceuticals and died as a result of these some days after admission.

Of the 2 fatal cases of Illicit Drug Use, case 2 presented via ambulance to the ED in full cardiac arrest, despite full resuscitative measures, after a presumed intravenously administered overdose of heroin. It was noted that he had had a past history of opiate dependence and therefore was not a naive user. This fits the previously identified pattern of risk factors for death from narcotic overdose of experienced, male users, aged late twenties to early thirties, often after a period of abstinence or with use of unexpectedly pure drug[29].

The second Illicit Drug Use fatality, case 3 in Table 25, died as a result of an acute intra-cranial haemorrhage following intravenous methamphetamine use; a well recognised complication of abuse of this type of drug. Unusually though for this complication, this patient was not a naïve amphetamine user, having a long history of daily intravenous abuse of amphetamines. The blood level of methamphetamine of 0.35 mg/L is well within the generally quoted toxic range[30], but was not the highest level detected in the study (see Section 3.3.2. "Amphetamines Drug Levels") and is somewhat less than the quoted lethal range. It is quite likely however, that the patient's peak blood levels were even higher at the time of the initial collapse.

3.1.5 Summary

Enrolments:

- In the reporting period August 2004 to August 2005 there were 1463 completed enrolments with 1134 patients (77.5%) testing positive to drugs.

Demographics:

- The male to female ratio for drug-positive enrolments 3:2
- 89% were Caucasian with 4.5% Indigenous, and under 2% Asian
- The majority of enrolments (67%) were aged between 18 and 35 years; 6% were aged less than 18 years
- Most patients presented over the weekend (50% between Friday 6 pm and Monday 6 am).
- The most likely time of day to present was between midnight Saturday and 6 am Sunday.
- Location of drug use was most frequently at a private residence (53%) usually the patient's own home
- 28% reported drug use at a licensed premise.

Patterns of drug use:

- A total of 63 different pharmaceutical and illicit drugs were detected with a total of 2405 positive drug tests
- Most patients presented as a result of Illicit Drug Use (61%), followed by Self-Harm (25%), and Drink Spiking (8%).

- Alcohol was the most common drug detected in 670 (59%) of the 1134 drug positive patients
- Benzodiazepines were the next most commonly detected drugs with 608 positive tests in 397 patients (35% of total), followed by amphetamines with 341 tests in 247 patients (22%), THC 259 tests (23%), and opioids with 189 tests in 149 patients (13%)
- Poly-substance abuse (>1 drug per person) was present in 58% of drug-positive patients
- The most common combination of drugs among Illicit Drug Users was alcohol + THC, in Self-Harming patients it was alcohol + benzodiazepines
- 18% of patients tested to 3 or more drugs
- The most number of drugs detected in any 1 patient was 7.

Clinical Correlates:

- Clinical suspicion of specific drug used was most accurate with alcohol, GHB and LSD but was poor with other drugs
- 58% of patients had a history of previous psychiatric illness
- 31% of patients had a documented past history of drug abuse or dependency
- Over half of drug-positive patients were determined to require immediate or urgent medical assessment compared to a rate of 23% for ED attendances generally during the same period.
- An altered heart rate was the most common abnormal clinical sign, with 4% having a bradycardia and 30% a tachycardia
- 20% of patients were hypothermic, 4% hyperthermic
- 9% of patients were comatose with a Glasgow Coma Score of less than 8
- 12% of patients had an agitated delirium or acute psychosis at presentation
- The admission rate for drug-positive patients was 50%, compared to an overall admission rate for all ED patients of 36%
- 12% of admitted patients, mainly Illicit Drug Users, left hospital against medical advice
- All but 1 of the 7 fatalities were aged 35 years or less; 3 were aged less than 18 years
- 4 deaths were the result of deliberate Self-Harm, with hanging the immediate cause of death in 3, all of whom tested positive to THC
- Of the 3 deaths directly attributable to drug toxicity 1 died as a result of opiate overdose, 1 due to intra-cerebral haemorrhage following amphetamine abuse and 1 as a result of other chemical ingestion.

3.2 RESULTS BY PRESENTATION TYPE

3.2.1 Illicit Drug Use

Enrolments:
Illicit Drug Use (defined as excessive or non-sanctioned use of both licit and illicit substances, including alcohol, across the spectrum of use from occasional to regular to dependent) was the most commonly cited reason for the drug exposure of enrolled patients (872 of all 1463 enrolled patients) and was the group with the largest number of drug positive results (687 patients of 1134, 61%). This was more than twice as frequent as the next most common presentation group, deliberate Self-Harm (280 drug positive enrolments, 25%).

Results and discussion in this and the following sections are limited to drug positive enrolments only.

Demographic details:
Ethnicity:
Nearly 89% of Illicit Drug Users were Caucasian, 6% Indigenous and just over 1% Asian (Table 26). Indigenous drug affected patients were proportionally far more likely than other ethnic groups to have presented as a result of Illicit Drug Use with approximately 80% of all Indigenous enrolments in this category (compares with 60% of Caucasian and 50% of Asian patients). The gender ratios for Caucasian and Indigenous patients were similar at approximately 5 male to 2 female patients, however ethnically Asian patients were exclusively male. Whether this represents true ethnic differences in drug taking behaviours or is due to the small sample size of Asian patients is uncertain.

Indigenous patients were slightly less likely to present via police or custodial services (3% compared to 8% for all Illicit Drug Users), were more likely to present on a Thursday or Friday night (48%) rather than the weekend (17%), and had markedly different patterns of drug use (Table 30).

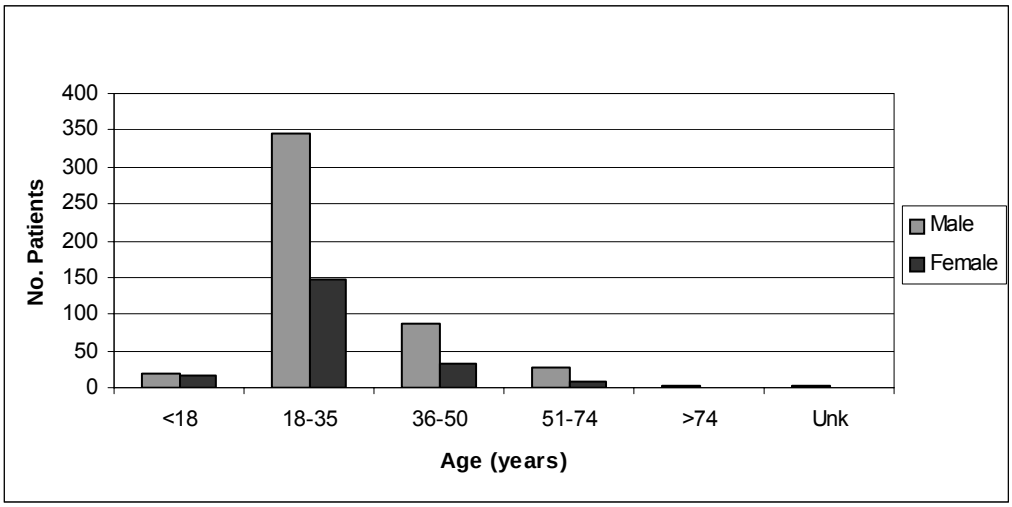
Table 26: Ethnicity and gender distribution of patients presenting as a result of Illicit Drug Use.

Ethnicity	Male	Female	Total (%)
Caucasian	425	183	608 (89)
Indigenous	28	12	40 (6)
Asian	9		9 (1)
African	1		1 (<1)
Arab	4		4 (1)
Other	17	8	25 (4)
Total	484	203	687

Age and Gender:
The average age of patients presenting as a result of Illicit Drug Use was just under 31 years, with only a slight difference between the genders (male average age 31.3 years and female 29.8 years). Just over 5% of patients were under the age of 18 years, and almost 6% were

older than 50 years (Figure 9). As with drug positive enrolments generally, there was an overt male predominance with a male to female ratio of 7:3. This ratio roughly held across all age groups except for those aged less than 18 years, where it was far less pronounced (20 male and 17 female patients).

Figure 9: Age and gender distribution of patients presenting as a result of illicit drug use.



(Unk = unknown)

Time of Presentation:

The most likely time of presentation to the Emergency Department of Illicit Drug Users was between midnight and 6 am Sunday. Almost half of the presentations were between 6 pm Friday and 6 am Monday (Table 27). Although there was a marked variation from month to month in the number of presentations, seasonal presentation rates were similar (range 21.5% in Spring to 28.7% in Summer).

Table 27: Day and time of day of Illicit Drug Use presentations.

Time	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Total (%)
0600- 1159	17	9	4	10	4	6	10	60 (15)
1200-1759	12	13	8	4	12	13	13	75 (18)
1800-2400	16	13	14	11	23	29	17	123 (30)
0001-0559	44	13	5	9	19	25	33	148 (37)
Total (%)	89 (22)	48 (12)	31 (8)	34 (8)	58 (14)	73 (18)	73 (18)	406

(Phase 2 data only*: n=406*)

Venue of exposure and mode of transport to ED:

Data on where the drug exposure occurred was recorded in 561 patients in the group. Of these the most commonly reported venue for the drug exposure was in a private residence (42%, Table 5). This data appears to contradict perceptions that most presentations to the RAH ED are sourced from inner city licensed venues. This data does correspond however, with reports from IDU of the location of injecting[16]. It should be noted though, that the majority of our enrolled patients' drug exposure were oral rather than intravenous. Approximately 180 patients (33%) reported the drug exposure occurred at a licensed venue. A proportion of those recorded as 'other' in Table 5 (5% overall) may also represent administration of drug in a

public place adjacent to licensed venues (eg street, car park, park land), or at a public outdoors event. Even if this is not the case, the fact that just over one third of all patients in this category came from a licensed venue may be cause for concern. Also of note is the fact that 12 patients were recorded as being in police or correctional services custody at the time of their drug exposure.

Data on mode of transport to the ED was recorded for approximately 400 patients (Table 28). In 73% of cases this was via ambulance (SAAS); in 8% it was via police or custodial services. As discussed in Section 3.1., the high rates of ambulance transport may suggest a higher than average degree of medical urgency than the average general patient attending the ED. It may also indicate that past reluctance on the part of illicit drug users to use SAAS services, due to a perceived risk of police involvement, is currently less of an issue.

Table 28: Mode of arrival to the ED for patients in the Illicit Drug Use category.

Mode of Arrival	Number of Patients (%)
Ambulance	295 (73)
Police/Custodial	32 (8)
Private car	47 (12)
Walked in	16 (4)
Taxi	8 (2)
Public Transport	1
Unknown	2
Volunteer transport	2
Other	3 (1)
Total	406

(Phase 2 data, *n=406*)

Patterns of Drug Use:

A total of 1403 positive drug tests were returned from the 687 drug positive patients. The detection rates of the major drug groups are shown in Table 29. Alcohol was the most common drug detected, followed by benzodiazepines (as a group), amphetamines (as a group), and THC. The gender ratios were broadly similar at 3 or 4 male to 1 female for most of the drug groups in which reasonable numbers were enrolled. The gender ratio for amphetamines and LSD were the notable exceptions with a much more even distribution for amphetamines, whereas all LSD enrolments were male.

Table 29: Gender distribution and total number of positive drug tests for the major drug groups in Illicit Drug Users.

Drug Type	Male (% total)	Female (% total)	Total Number of Positive Tests
Alcohol	308 (71)	126 (29)	434
Benzodiazepines	202 (72)	78 (28)	280
Amphetamines	154 (58)	112 (42)	266
THC	142 (77)	42 (23)	184
Opioids	87 (79)	23 (21)	110
GHB	25 (81)	6 (19)	31
Ketamine	3 (60)	2 (40)	5
Cocaine	3 (50)	3 (50)	6
LSD	5 (100)	-	5
Total	929	391	1321*

(*Excludes prescription drugs)

The patterns of drug use detected in Indigenous patients were quite different from that of the group as a whole (Table 30). Although alcohol and opiate detection rates were similar (30% and 6% of positive drug results respectively), proportionally, benzodiazepine and THC use were much more frequent (30% and 25% respectively compared to 18% and 12% in the group as a whole), and detection rates for the amphetamine group of drugs were much lower (6% compared to 17% incidence). Additionally, no positive results were returned for ecstasy (MDMA) and related drugs such as GHB, ketamine, or LSD.

Table 30: Incidence of positive drug results for major drug groups in Indigenous Illicit Drug Users.

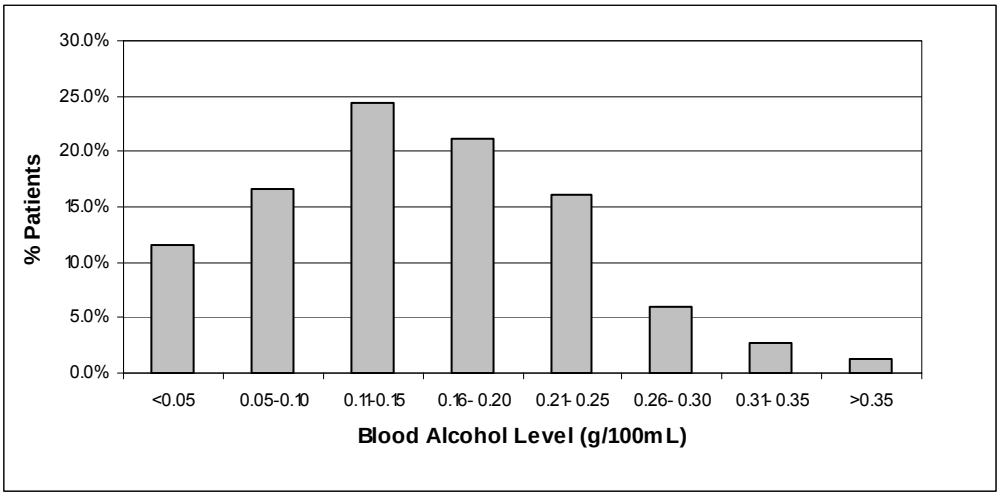
Drug Type	Number of Positive Tests
Alcohol	24
Benzodiazepines	24
THC	20
Amphetamines	5
Opioids	5

The average number of drugs detected per person in the Illicit Drug User group was 2.04, marginally less than the average of 2.12 for all drug-positive enrolments. However, only 41% of patients in this group tested positive to 1 drug, mostly alcohol, whilst 6% tested positive to more than 3 drugs (Table 8). The most number of drugs detected in any patient was in the Illicit Drug Use category (7 drugs detected, see case details).

Alcohol:
Alcohol was the most frequent drug detected, present in 63% of Illicit Drug Users. This compares with the average rate of detection amongst all drug-positive enrolments of 60%. Just

under 50% of these patients had blood alcohol levels in excess of 0.15 g/100mL (moderate to severe intoxication) and over 1% had levels in excess of 0.35 g/100mL (potentially fatal). The average blood alcohol level was 0.16 g/100mL which was the highest of all presentation categories other than "Unknown". The single highest blood alcohol level of 0.42g/100mL was also recorded in an Illicit Drug User.

Figure 10: Blood alcohol levels of Illicit Drug Users.



Benzodiazepines:
One hundred and ninety eight patients returned 291 positive benzodiazepine test results, with nordiazepam, the major metabolite of diazepam, most commonly detected (Table 31). Although the largest number of benzodiazepine-positive tests was returned by Illicit Drug Users, proportionally these drugs were more commonly detected in the Self-Harm group (29% of Illicit Drug Use patients compared to 59% of Self-Harm patients returned positive benzodiazepine tests).

Table 31: Incidence of detection of benzodiazepines in Illicit Drug Users.

Drug Name	Number of Positive Tests (%)
Temazepam	24 (8)
Clonazepam	14 (5)
Nordiazepam	168 (58)
Oxazepam	35 (12)
Alprazolam	44 (15)
Nitrazepam	4 (1)
Lorazepam	1(<1)
Bromazepam	1 (<1)
Total positive tests	291

(nordiazepam is the principle metabolite of diazepam)

Amphetamines:
One hundred and ninety one patients returned 266 positive amphetamine test results (Table 32). The large majority of amphetamines were detected in Illicit Drug Users (77%). Although

proportionally, amphetamine use was also highest in the Illicit Drug User group (28% of patients in the group testing positive) the differences between the presentation groups was less pronounced than expected with quite high rates of detection in both the victims of Drink Spiking and in the "suspected" drug use categories (Table 111, Section III, "Amphetamines"). The most frequently detected amphetamine was methamphetamine (52%), followed by MDMA (ecstasy, 29%) and amphetamine (17%). Other drugs in the class were detected in only very small numbers. It is likely that a large proportion of the amphetamine (the drug) positive results were a result of metabolism of methamphetamine (see discussion Section III, "Amphetamines")

Table 32: Incidence of detection of amphetamines in Illicit Drug Users.

Drug Name	Number of Positive Tests (%)
Methamphetamine	137 (52)
MDMA	77 (29)
Amphetamine	44 (17)
Pseudoephedrine	3 (1)
Ephedrine	2 (<1)
MDA	2 (<1)
MDEA	1 (<1)
Total positive tests	266

THC:
THC, the major psychoactive constituent of cannabis was present in 27% (184 of 687) of the patients presenting as a result of Illicit Drug Use, and 71% of all THC positive patients were Illicit Drug Users. This rate of detection coincides with the pre-study estimates of 25% but, as discussed below, is surprising in that it matches the detection rates found for both amphetamines (28%) and benzodiazepines (29%).

Opioids:
The incidence of opioids detected in Illicit Drug Users was surprisingly low at 110 positive tests in 83 patients (Table 33). This represents only 12% of Illicit Drug Users (83 of 687 patients). It is possible that many of the cases positive for codeine may have been where the drug was used for therapeutic purposes, further lowering the proportion of cases presenting as a result of opiate abuse (see Section III, "Opioids" for further discussion).

All patients testing positive to heroin were Illicit Drug Users. It is probable that a proportion of those testing positive to morphine had used heroin but the parent compound had been metabolised to morphine by the time of arrival in the ED. This is suggested by the fact that heroin was reported or suspected to have been used more frequently than morphine (37 versus 31 cases) but detection rates were much higher for morphine (42 morphine versus 4 heroin). None the less, morphine was reported to have been the parent compound of abuse in a number of cases, and combined with the rate of detection of methadone, some diversion of prescribed opiate medication is suggested by this data. The low number of heroin cases may also be related to the national shortage of heroin, experienced since 2001[21,22].

Table 33: Incidence of detection of opioids in Illicit Drug Users.

Drug Name	Number of Positive Tests (%)
Morphine	39 (36)
Methadone	29 (26)
Codeine	36 (33)
Heroin	4 (4)
Dextropropxyphene	2 (2)
Total positive tests	110

Others:
The large majority of patients testing positive to gamma hydroxy butyrate (31 of a total of 36 patients), ketamine (5 of 6 patients), and cocaine (6 of 8 patients), and all cases of LSD were Illicit Drug Users (see specific drug categories in Section 3.3. for further discussion).

Drug Habit:
The history of self-reported current Illicit Drug Use by patients was relatively well recorded with data from 542 of the 687 patients obtained (79%) (Table 34). A total of 1456 major drugs of interest were reported as being abused; an average of 2.7 drugs per person which is somewhat greater than the detected drug rate among Illicit Drug Users of 2.04 drugs per person. This is perhaps not unexpected given that reported use covers an extensive period of time whereas testing measures use within a very limited time period.

Not surprisingly, cigarettes and alcohol were the most commonly reported drugs used and their reported use was 'frequent' (daily or weekly). More patients reported use of amphetamines (as a class) than reported cannabis use. This is congruent with the relative rates of actual drug detection in this study but, as discussed previously, contrary to comparative usage rates reported elsewhere[15]. The average frequency of use of cannabis however, was considerably higher than that of amphetamines (typically daily versus weekly use).

Benzodiazepine abuse in Illicit Drug Users was reported relatively infrequently compared to the actual rates of detection (13% of drug use reports compared to a detection rate of over 29%)[I]. It is possible this low reporting rate reflects a perception by patients that they are not a drug of abuse, either because many are prescribed or, as has recently been suggested they may be commonly used to self-medicate against adverse effects of other "primary" drugs of abuse such as opiate and amphetamine withdrawal.

[I] *Rates of reported use would be expected to be significantly greater than detection rates as blood results will be positive only after relatively recent use for most drug types, whereas reported use may have been days or weeks prior to presentation.*

Table 34: Frequency of drug use reported by Illicit Drug Users.

Reported Drug Use	Frequency of Use							Total Responses
	Never	Daily	Weekly	Monthly	Yearly	Not specified*	Past use only	
Alcohol	1	177	171	24	2	75	2	452
Cigarettes		224	11	7	1	12	2	257
Cannabis		86	39	27	4	32	3	191
Amphetamines		36	54	19	6	49	1	165
Methamphetamine		12	22	19	7	25		85
Heroin		13	11	7	3	33	9	76
Benzodiazepines		43	6	1	2	18		70
MDMA (ecstasy)		2	12	16	6	26		62
GHB/Fantasy		1	5	5	3	8		22
LSD/Acid			2	2	3	9	1	17
Cocaine			2	1	5	8		16
Ketamine				1	3	5		9
Solvents		1				4		5
Nitrous/Bulbs					1	4		5
Amyl/Rush					1	3		4
Mushrooms					3	7		10
Other						1		1

(*Stated drug used but frequency of use not recorded, data not recorded for all patients)

The level of reported use of both LSD and cocaine was much higher than our detection rates, suggesting that abuse of these drugs may be a larger problem than our data would otherwise indicate. Additionally, there were relatively high rates of reported abuse of hallucinogenic mushrooms (comparative to ketamine and perhaps cocaine), the active compounds of which we are not able to test for.

A comparison of what patients reported as having previously used (Table 34 above) and what was detected on blood testing these patients is shown in Table 35. The very high incidence of poly-drug abuse discussed in earlier sections is highlighted by this table. For example, of the 191 patients reporting THC use 109 (57%) tested positive to it on their attendance to the ED), 115 tested positive to benzodiazepines (a rate of 60%), 90 patients (47%) were positive to alcohol, and 87 (45%) tested positive for drugs of the amphetamine group. Similarly, of the 62 patients who stated they had used MDMA (ecstasy), over one third tested positive to alcohol, cannabis (THC), methamphetamine, and/or benzodiazepines.

Table 35: Comparison of drug use reported by patients and the drugs actually detected on presentation to the ED.

Drugs Detected on Testing	Drug Usage as Reported by Patient*																
	Cigs	Alcohol	THC	Amphet	Methamph	GHB	Ketamine	Cocaine	Benzo	Solvent	Nitrous oxide	Amyl nitrate	LSD	MDMA	Heroin	Mush-rooms	Other Opioids
Alcohol	136	329	90	58	29	3	2	6	28	3	1	1	5	22	26	4	5
THC	93	126	109	81	31	8	6	5	29	2	4	4	8	23	27	6	3
Amphetamine	25	26	20	29	13	3	1	1	7				2	4	7		1
Methamphetamine	72	78	53	81	33	12	7	4	20		2	1	4	23	14	2	
GHB	8	10	4	5	2	12	3	1	1					3	2		
Ketamine	2	4		2										1			
Cocaine	3	3	1	2	3		1	4	2					3			1
Benzodiazepine	136	198	103	89	44	5	2	9	94	1	3	2	10	23	74	4	9
LSD	2	3	2		1								3	1		1	
MDMA (ecstasy)	22	46	14	12	7	2	3	3	5		1	1	1	24	1	1	1
Heroin	1	1													3		
Methadone	22	16	13	12	3			1	11		1	1	2	3	14		1
Morphine	26	27	17	12	10	1	1		14				2	1	26	1	3
Codeine	18	21	10	12	4			1	8				1	2	17		1
Pseudoephedrine	2	2		1				28						1	1		
Ephedrine		1					1	29						1			
MDA							1	7									
MDEA								20									

(*Refers to drug use other than that leading to or associated with this ED presentation, as per Table 34)

Clinical Correlates:
Relevant data on the clinical correlates for patients in the Illicit Drug Use category has also been reviewed in "Clinical Correlates" of Section 3.1.

Presenting Complaint:
The primary clinical reason for attending the ED was enormously varied, ranging from cardiac arrest to minor laceration (Table 36, Phase 2 data only, *n=406*). Apart from those cases listed as "drugs misuse", the large majority of patients presented as a result of trauma (99 patients, 25%), cardiovascular or neurological complications (46 patients (11%) and 69 patients (17%) respectively), or psycho-social complaints (43 patients (10%)). The cardiovascular and neurological complications were typically associated with collapse and a decreased level of consciousness. Just under 10% of Illicit Drug Users (38 of the 406 patients) had presented to the ED as a result of being involved in a motor vehicle accident.

Table 36: Primary clinical reason for attending the ED as per presentation.

Presenting Complaint	Complaint Specific	Number of Patients		Presenting Complaint	Complaint Specific	Number of Patients
CVS	cardiac arrest	1		Psycho-social	bizarre behaviour	5
	chest pain	6			drugs misuse	100
	collapse	10			hallucinations	1
	other	2			other	20
	tachycardia	2			crisis	12
	unconscious	25			violent	5
Endocrine	falls	1		Single trauma	laceration	9
	hyperglycaemia	1			assault	19
GI	abdomen pain	6			blunt injury	7
	diarrhoea &/or vomiting	6			fall	11
Musculo-skeletal	back pain	1			laceration	2
	other	3			stab wound	1
Neurologic	Low GCS	58		Skin	infection	3
	seizure	10		Systemic	other	1
	weakness	1		Multi-trauma	assault	4
Other	? Hepatitis	1			fall	2
Poisoning	drugs misuse	9			head injury	1
	other	14			MVA	38
Respiratory	apnoea	1			stabbing	2
	short of breath	2			other	3
				Total		406

Phase 2 of study only (n=406) (CVS = cardiovascular system, GI = gastro-intestinal, multi-trauma = trauma severity requiring trauma team assessment, single trauma = trauma severity not requiring trauma team assessment, GCS = Glasgow Coma Score, apnoea = cessation of breathing, MVA = motor vehicle accident)

Triage Category:
The Illicit Drug Users group had the second highest proportion of patients triaged as requiring immediate medical assessment on their arrival to the ED (18%)[m], and over half of all patients in this category were triaged to either category 1 or category 2 (most urgent of 5 triage categories; Table 17).

A total of 123 patients were assigned the most urgent triage category of 1. These patients returned a total of 257 positive drug results at an average of 2.1 drugs per patient. This ratio was, unexpectedly, fairly constant across the triage categories for Illicit Drug Users.

Table 37: Distribution of patient triage priorities according to a positive test for a major drug of interest among Illicit Drug Users.

	Triage Priority					
Drug Type	**1**	**2**	**3**	**4**	**5**	**Total**
Alcohol	80	146	134	66	8	434
Benzodiazepines	45	81	117	33	4	280
THC	25	66	62	28	3	184
Amphetamines (group)	44	106	98	17	1	266
Methamphetamine	20	52	53	12	0	137
MDMA	15	31	27	3	1	77
Amphetamine	7	18	17	2	0	44
Pseudoephedrine	0	2	1	0	0	3
Ephedrine	0	2	0	0	0	2
MDA	1	1	0	0	0	2
MDEA	1	0	0	0	0	1
Opioids (group)	26	32	40	12	0	110
Morphine	10	12	13	4	0	39
Codeine	10	12	10	4	0	36
Methadone	3	6	17	3	0	29
Heroin	3	1	0	0	0	4
Dextropropxyphene	0	1	0	1	0	2
GHB	22	8	1	0	0	31
Antidepressants	10	15	8	5	0	38
Antipsychotics	0	1	2	1	0	4
Cocaine	1	3	2	0	0	6
Ketamine	0	2	2	1	0	5
LSD	0	0	3	2	0	5
Total						1364

(May have tested positive for more than 1 substance)

GHB (Fantasy) was the drug most likely to result in the need for immediate medical management with 97% of patients (30 of 31 patients) testing positive to this drug being given a

[m] *Although patients classified as "Other" had a higher proportion of more urgent patients, it is believed that the majority of these had used drugs in a manner similar to the Illicit Drug User group.*

triage category of 1 or 2. Drugs most likely to be found in a patient presenting critically unwell as a result of Illicit Drug Use were: alcohol, benzodiazepines, THC, GHB, and/or methamphetamine. Patients testing positive to LSD were on average, allocated the least urgent triage category. However, as the number of LSD positive patients enrolled was small, the significance is uncertain.

Clinical Vital Signs:
Data on recorded clinical vital signs is shown in Tables 38 and 39. An abnormal heart rate (rate > 100 (tachycardia) or < 60 beats per minute (bradycardia)) was the most frequently detected abnormal clinical vital sign; 34 patients had rates likely to be clinically important (rate > 150 or < 60 bpm). Although bradycardia was most frequently seen in patients testing positive to benzodiazepines (29 patients), the drug most likely to be associated with bradycardia was GHB (10 of the 31 (32%) GHB-positive patients). Tachycardia was most likely to be seen in patients testing positive to amphetamines.

Nineteen patients were very hypotensive (blood pressure < 90) and likely to have been in a shocked state, with alcohol the most frequently detected drug in these patients. One patient, who tested positive to amphetamines, had a blood pressure of greater than 200; this level of blood pressure potentially places the patient at risk of neurological (eg stroke) or cardiac (eg infarction) adverse events.

Signs suggestive of profound depression of respiratory function were seen in 14 patients with a respiratory rate < 10 and 13 patients with blood oxygen saturations of less than 90%. Opioids were most likely to depress respiratory function followed by GHB and benzodiazepines.

Eleven patients had hyperthermia (temperature > 37.5ºC) and 33 hypothermia (temperature < 35ºC) (Phase 2 data only).

Tables 38 and 39: Clinical vital signs measures in Illicit Drug Users.

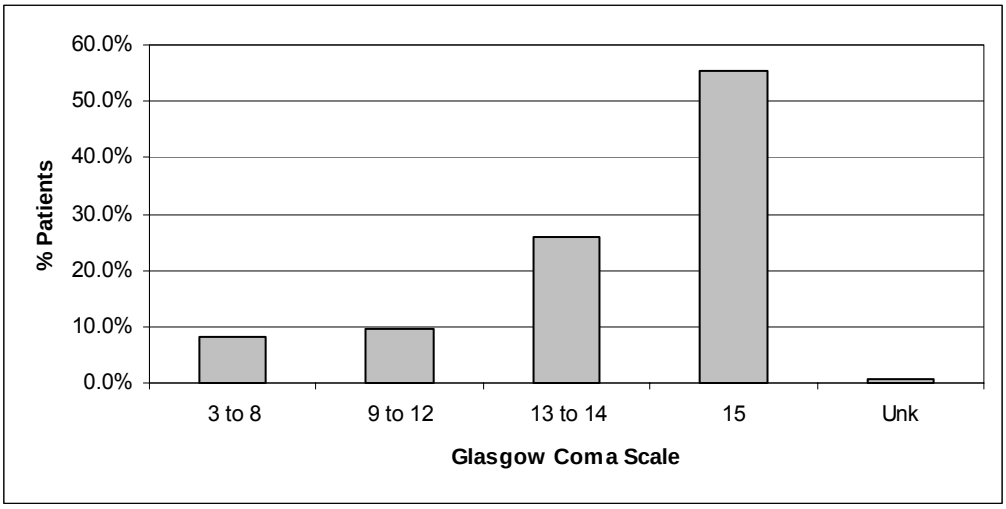
Pulse Rate	No. Patients
Not recorded	25
<60	28
60-100 (NR)	445
101-150	183
>150	6
Systolic BP	**No. Patients**
Not recorded	35
<90	19
90-150 (NR)	573
150-200	59
>200	1

RR	No. Patients
Not recorded	54
<10	14
10 to 20 (NR)	519
21-30	92
>30	8
Oxygen Saturation	**No. Patients**
Not recorded	107
<85	
86-90	13
91-95	68
96-100 (NR)	499

(BP = blood pressure, NR = normal range, RR = respiratory rate)

The GCS allocated to Illicit Drug Users are depicted in Figure11. Of the 683 patients in whom this data was collected 15 (2%) had a GCS of 3 reflecting the deepest level of unconsciousness, and 57 (just over 8%) were classified in the range 3 to 8 ('severely' depressed conscious state, generally requiring management of the patients' airway).

Figure 11: Conscious levels of patients as measured by the Glasgow Coma Score (GCS): 3 to 8 (severe), 9 to 12 (moderate), 13 to 14 (mild), 15 (normal).



(Unk = unknown)

Disposition from the ED:
Approximately 43% of Illicit Drug Users were admitted to hospital (Table 40). Of these, 17% (7% of the total Illicit Drug Use group) required intensive care or a high dependency admission. Ultimately, approximately 85% of patients had been discharged home from hospital by the time of completion of data entry (generally within 2 weeks of enrolment). Two patients died (see details page 31), and 7 remained in long-term rehabilitation facilities.

Tables 40 and 41: Place to which patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total (%)
Discharged	393 (57)
Admitted	280 (43)
EECU	152 (22)
General Ward	70 (10)
ICU/HDU	47 (7)
Cardiology	3 (<1)
Psych. Ward	6 (1)
Transferred	14 (2)
Unknown	4 (<1)

Disposition from Hospital	Total (%)
Home	584 (85)
Absconded	52 (8)
Psych services	24 (4)
SAPOL custody	13 (2)
Rehabilitation	7 (1)
Died	2 (0.3)
Other hospital	1
Other/Unknown	3

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit, Psych = Psychiatry, SAPOL = South Australian Police)

Summary:

Enrolments:

- Illicit Drug Use was the most commonly cited reason for the drug exposure of enrolled patients (872 of 1463 patients (60%)) and was the group with the largest number of drug positive results (687 of 1134 drug-positive patients (61%)).

Demographics:

- 89% of Illicit Drug Users were Caucasian and 6% Indigenous
- Indigenous patients were more likely to present as a result of Illicit Drug Use than other ethnicities (80% of Indigenous enrolments, 60% of Caucasian, and 50% of Asian)
- The overall male to female ratio was 7 to 3
- The average age of Illicit Drug Users was approximately 31 years
- 5% were under 18 years of age and 6% were older than 50 years
- 42% of Illicit Drug Users reported drug exposure occurring in a private residence
- 73% of patients arrived by ambulance; 8% via police or other custodial services.

Patterns of Drug Use:

- A total of 1403 positive drug tests were returned from the 687 patients
- Alcohol (63%), benzodiazepines (29%), amphetamines (28%), THC (27%), and opioids (12%) were the most commonly detected drugs
- Indigenous patients were more likely to return tests positive for benzodiazepines and THC, and less likely to test positive for an amphetamine, or ecstasy (MDMA) and related drugs such as GHB, LSD or ketamine
- 59% of patients tested positive to more than 1 drug; 6% to more than 3 drugs
- Half of alcohol-positive tests returned blood levels greater than 0.15 g/100mL; over 1% returned levels over the potentially fatal threshold (> 0.35 g/100mL)
- Detection rates for psycho-stimulants were much higher than anticipated
- The large majority (77%) of psycho-stimulant results were returned in Illicit Drug Users
- The most frequently detected psycho-stimulant was methamphetamine (52%), followed by MDMA (29%), and amphetamine (17%)
- Overall detection rates for opioids were lower than expected
- Very low rates of heroin detection may relate to rapid metabolism and /or delayed presentation; reported usage rates suggested it to be much higher
- A rapid increase in presentations as a result of heroin use was reported in September 2005
- There is evidence for diversion and abuse of prescribed opioids morphine and methadone

- Rates of benzodiazepines use was very much under-reported by drug-positive patients compared to other drug types
- Apart from those cases listed as “drugs misuse”, the large majority of patients presented as a result of trauma (99 patients, 25%), cardiovascular or neurological complications (46 patients (11%) and 69 patients (17%) respectively), or psycho-social complaints (43 patients (10%)).

3.2.2 Self-Harm

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

Poisoning or intoxication as a result of drug use in association with deliberate Self-Harm was the second most commonly cited reason for presentation to the Emergency Department with 280 patients enrolled in this group (25% of all drug positive enrolments).

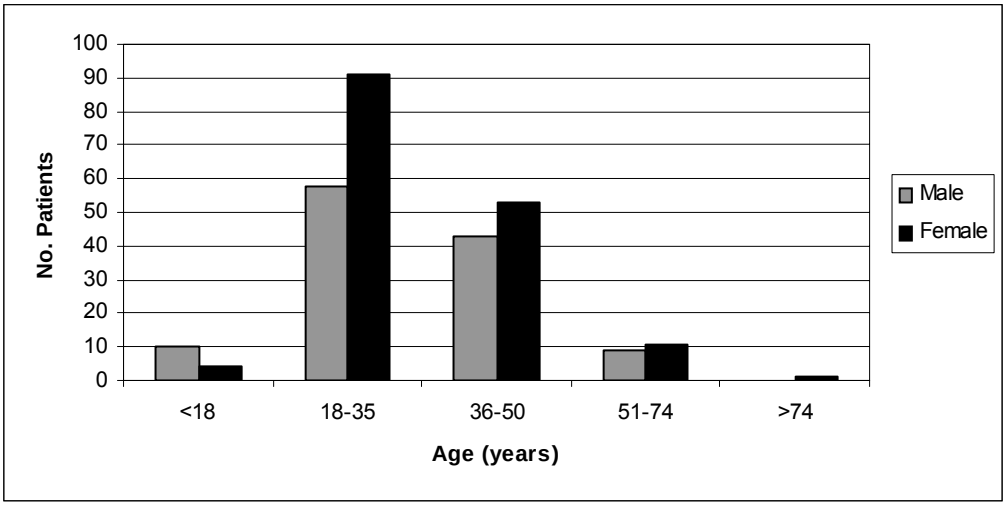
Demographic details:
Ethnicity:
The overwhelming majority of patients in this group were Caucasian (95%), with a smaller proportion of Indigenous patients than in the Illicit Drug Use category (2.5% of Self-Harm patients compared to 6% of Illicit Drug Users). Other ethnic groups were enrolled in only very small numbers (Table 42).

Table 42: Ethnicity and gender distribution of patients presenting as a result of Self-Harming drug use.

Ethnicity	Male	Female	Total (%)
Caucasian	107	159	266 (95)
Indigenous	5	2	7 (2.5)
Asian	0	2	2 (0.7)
Other	2	3	5 (1.8)
Total	114	166	280

Age and Gender:
The average age of patients presenting as a result of Self-Harm was approximately 34.5 years, with little difference between the genders (male average age 34.2 years and female 34.5 years). The age distribution of patients in the Self-Harm group was very similar to that of the Illicit Drug User group with 5% aged under 18 years and 7% over 50 years of age (Figure 12). Unlike Illicit Drug Uses however, there was a female predominance with a male to female patient ratio of 3:4 (compared to 7:3 for Illicit Drug Users). This female predominance held across most age groups and was most marked in those aged 18 to 35. The exception was in patients aged less than 18 years, where the ratio was reversed (10 male to 4 female patients).

Figure 12: Age and gender distribution of patients presenting as a result of Self-Harming drug use.



Time of Presentation:

The day and time that patients in this category presented to the ED was much more evenly distributed across the week and the day than was the case with Illicit Drug Users (Table 43). None-the-less, 41% of these patients' presentations still occurred between 6pm Friday and 6am Monday.

Table 43: Day and time of Self-Harming drug use presentations to the ED.

Time	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Total (%)
0600- 1159	4	1	6	2	1	5	2	21 (13.3)
1200-1759	6	9	4	2	3	7	5	36 (22.8)
1800-2400	7	3	8	7	16	10	10	61 (38.6)
0001-0559	10	5	8	4	4	2	7	40 (25.3)
Total (%)	27 (17)	18 (11)	26 (17)	15 (10)	24 (15)	24 (15)	24 (15)	158

(Phase 2 data only, *n=158*)

Venue of exposure and mode of transport to ED:

Of the 460 patients for whom the venue of drug exposure could be determined 429 (93%) occurred at a private residence (Table 5). The means of transport to the ED was largely by ambulance, and the distribution across the various transport options closely matched that for Illicit Drug Use (Table 28).

Table 44: Mode of arrival to the ED for patients in the Self-Harm category.

Mode of Arrival	Number of Patients (%)
Ambulance	120 (76)
Police/Custodial	11 (7)
Private car	22 (14)
Walked in	3 (2)
Taxi	1 (<1)
Other	1 (<1)
Total	158

(Phase 2 data only, *n=158*)

Patterns of Drug Use:

Not unexpectedly, the patterns of drug use differed considerably from Illicit Drug Users, with benzodiazepines, opioids, antidepressants and antipsychotics proportionally more common and alcohol, amphetamines, and ecstasy and related drugs proportionally much less commonly found.

Multiple drug use was again a feature of these patients. A total of 687 positive drug tests[n] were returned from the 280 patients. The average of 2.45 drugs per person in this group was higher than the average of 2.04 for Illicit Drug Users; 67% tested positive to more than 1 drug (Table 45) compared to 59% in illicit drug use group. The detection rates of the major drug groups are shown in Table 46.

Table 45: Number of patients testing positive to 1 or more drugs.

Number of Drugs	Number of Patients (%)
1	92 (33)
2	104 (37)
3	49 (18)
>3	35 (12)
Total	280

The gender ratios across the drug types were generally similar ranging from approximately 5 male to 6 to 8 female patients. The exceptions were antidepressants where the ratio was much lower at 1 male to 3 females, and THC where the male to female ratio was reversed at 8 male to 5 female patients.

[n] *Diazepam excluded on the basis that nor-diazepam, it's major metabolite, was present in all cases and is included.*

Table 46: Gender distribution and total number of positive drug tests for the major drug groups in Self-Harming drug users.

Drug Type	No. of Males (% of total)	No. of Females (% of total)	Total No. of patients testing positive	% of Self-Harm patients (n=280)	Total No. of positive tests
Benzodiazepines	95 (38)	157 (62)	252	90	270
Alcohol	59 (42)	80 (58)	139	50	139
Antidepressants	22 (25)	65 (75)	87	31	90
Opioids	29 (44)	36 (56)	65	23	65
THC	26 (67)	13 (33)	39	14	39
Antipsychotics	13 (45)	16 (55)	29	10	29
Amphetamine	10 (43)	13 (57)	23	8	23
Cocaine	2 (100)	0	2	0.7	3

Benzodiazepines:
The benzodiazepines were the most frequently detected type of drug with 252 positive tests in 164 patients. This number excludes tests positive for diazepam as its major metabolite, nordiazepam, is already included in this figure. As was the case with Illicit Drug Users, nordiazepam was detected most frequently (Table 47).

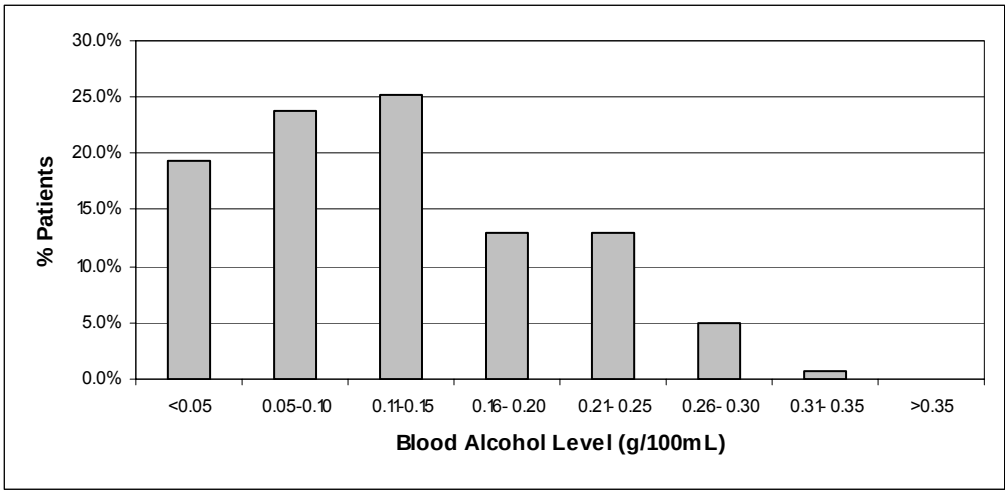
Table 47: Incidence of detection of benzodiazepines among Self-Harming drug users.

Drug Name	Number of Positive Tests (%)
Nordiazepam*	118 (47)
Temazepam	50 (20)
Oxazepam	38 (15)
Alprazolam	29 (11)
Nitrazepam	7 (3)
Lorazepam	4 (2)
Clonazepam	3 (1)
Triazolam	1(<1)
Flunitrazepam	1(<1)
Bromazepam	1(<1)
Total positive tests	252

(*major metabolite of diazepam)

Alcohol:
Alcohol was found in 50% of patients, somewhat less than the 63% of Illicit Drug Users. The average blood alcohol concentration was also lower in Self-Harm patients; 32% of patients had levels > 0.15 g/100mL (Figure 13) compared to 53% of Illicit Drug Users, and only one patient had a level in excess of 0.30 g/100mL.

Figure 13: Blood alcohol levels of Self-Harming drug users.



Antidepressants & Antipsychotics:
Eighty two patients returned 90 positive tests for antidepressants and 28 patients returned 29 positive tests for antipsychotic medication (Table 48).

Table 48: Incidence of detection of the antidepressant and antipsychotic drugs in Self-Harming drug users.

Antidepressant Drug	Number of Positive Tests	Antipsychotic Drug	Number of Positive Tests
Amitryptiline	7	Quetiapine	11
Fluoxetine	7	Olanzapine	11
Citalopram	26	Chlorpromazine	7
Moclobemide	1	Clozapine	
Mirtazapine	9		
Sertraline	12		
Venlafaxine	25		
Raboxetine	1		
Fluvoxamine	2		
Total	90		29

Opioids:
Opioids were the forth most commonly detected drug in this group. The large majority of these were codeine (Table 49). The highest blood codeine concentration recorded was 0.93 mg/L (toxic range 0.3 to 1.0 mg/L) from a deliberate overdose of paracetamol/codeine composite analgesic.

Table 49: Incidence of detection of opioids in Self-Harming drug users.

Drug Name	Number of Positive Tests (%)
Codeine	38 (59)
Morphine	15 (23)
Methadone	8 (12)
Dextropropxyphene	3 (5)
Oxycontin	1 (<1)
Total positive tests	65

Amphetamines:
Not surprisingly, drugs in the amphetamine group were relatively infrequently detected when compared to Illicit Drug Users. However, a surprisingly high number of tests positive for pseudoephedrine were returned. Out of a total of only 10 cases positive for the drug, 7 were seen in the Self-Harm group, including the case with the highest blood level (3mg/L, lethal level >19 mg/L). This latter case also tested positive to alcohol, paracetamol, an antiinflammatory drug, and an antidepressant. All 7 cases were female. Apart from the high proportion of pseudoephedrine, the rates of detection of the other amphetamines relative to each other was much the same as in the Illicit Drug User group (Table 50), with methamphetamine the most frequently detected.

Table 50: Incidence of detection of amphetamines in Self-Harming drug users.

Drug Name	Number of Positive Tests (%)
Methamphetamine	12 (52)
MDMA	3 (13)
Amphetamine	1 (4)
Pseudoephedrine	7 (30)
Total positive tests	23

THC:
Cannabis (THC) was detected in 14% of patients in the group compared to 27% of Illicit Drug Users. Very few tests positive for ecstasy and related drugs were returned, with only the 3 cases of ecstasy (MDMA) and 1 of cocaine; no tests were positive for GHB, LSD, or ketamine.

Drug Habit:
The substance use habits reported by patients presenting as a result of deliberate self-harm are shown in Table 51. Interestingly, as was the case with Illicit Drug Users, benzodiazepines were markedly under-reported compared to their rates of detection. Never-the-less, benzodiazepines were still the third most frequently cited drug used by this group of patients after alcohol and cigarettes. Although a minimal number of tests positive for ecstasy and related drugs were returned in this group (1 cocaine and 3 MDMA) Table 51 would indicate that abuse of these drugs is not uncommon.

Table 51: Frequency of drug use reported by patients in the Self-Harm group.

	Frequency of Use						
Reported Drug Use	**Daily**	**Weekly**	**Month**	**Year**	**Not specified***	**Past use only**	**Total Responses**
Alcohol	82	41	16		12	2	153
Cigarettes	91	4	2	1	4		102
Benzodiazepines	50	1	2	1	13		67
Cannabis	31	11	11	3	6	2	64
Amphetamines	7	10	4	2	12	2	37
Methamphetamine	4	6	1	1	12		24
Heroin	3	3		1	5	3	15
MDMA (ecstasy)		3	2	1	9	3	18
GHB/Fantasy		1			3	1	5
LSD/Acid					6	2	8
Cocaine		2		1	5	2	10
Ketamine					2		2
Solvents					2	1	3
Nitrous/Bulbs					1		1
Amyl/Rush					1		1
Mushrooms					3	1	4

(*Stated drug used but frequency of use not recorded) (data not recorded for all patients)

Clinical Correlates:
Relevant data on the clinical correlates for patients presenting intoxicated in association with Self-Harm has also been reviewed in “Clinical Correlates” of Section 3.1.

Presenting Complaint:
For those patients in whom the data was recoded (Phase 2 data only), the primary reason for attending the ED was generally for psycho-social reasons (87 of 153 patients, (57%); Table 52); specifically for “drug misuse” in the setting of deliberate self-harm. Just over 6% of patients presented as a result of major trauma (10 of 153 patients).

Table 52. Primary clinical reason for attending the ED as per presentation complaint.

Presenting Complaint	Complaint Specific	Number of Patients		Presenting Complaint	Complaint Specific	Number of Patients
CVS	chest pain	1		Psycho-social	drugs misuse	87
CVS	collapse	1		Psycho-social	situational crisis	7
CVS	unconscious	3		Psycho-social	section 23	5
Drug	other	2		Psycho-social	other	6
Neuro	altered conscious state	15		Single Trauma	blunt- assault	1
Poisoning	conscious	5		Single Trauma	fall	1
Poisoning	OD	9		Single Trauma	hanging	2
Poisoning	other	2		Multi-trauma	MVA	3
				Multi-trauma	self stabbing	3

(Phase 2 only) (CVS = cardiovascular system, GI = gastro-intestinal, neuro = neurological, multi-trauma = trauma severity requiring trauma team assessment, single trauma = trauma severity not requiring trauma team assessment, MVA = motor vehicle accident)

Triage Category:

A total of 40 patients (14%) in the Self-Harm group were assigned the most urgent triage category of 1. These patients returned a total of 120 positive drug tests, an average of just over 3 drugs per patients. The next most urgent triage category was assigned to 99 patients who returned 255 tests at approximately 2.58 drugs per person; for triage category 3 and 4 patients this ratio was 2.17 and 2.25 drugs per patient respectively. This data appears to suggest an association between poly-drug abuse and degree of medical urgency at presentation. This was also seen, though to a lesser degree, in the Illicit Drug Use group, with the average number of drugs per person ranging from 1.78 for priority 5 to 2.08 for priority 1. No patients in the Self-Harm group were assigned the lowest urgency triage category of 5.

Table 53: Distribution of patient triage priorities according to a positive test for a major drug of interest in Self-Harming patients.

Drug	Triage Priority					Total
	1	2	3	4	5	
Benzodiazepines	23	63	74	4	0	164
Alcohol	24	52	59	4	0	139
Antidepressants	18	18	38	3	0	77
Opioids (group)	11	20	22	1	0	54
Codeine	7	15	15	1	0	38
Morphine	4	4	7	0	0	15
Methadone	1	3	4	0	0	8
Dextropropoxyphene	2	0	1	0	0	3
Oxycontin	1	0	0	0	0	1
THC	6	17	15	1	0	39
Antipsychotics	6	11	10	1	0	28
Amphetamines (group)	4	6	9	0	0	19
Methamphetamine	2	5	5	0	0	12
Pseudoephedrine	2	1	4	0	0	7
MDMA	0	1	2	0	0	3
Amphetamine	0	1	0	0	0	1
Cocaine	0	0	2	0	0	2
Others	7	16	17	0	0	40

Patients assessed as requiring immediate management on arrival to the ED (triage category 1) were most likely to subsequently test positive to benzodiazepines or alcohol (Table 53).

Clinical Vital Signs:
The majority of patients presenting following Self-Harm recorded vital signs within normal limits (Table 54 and 55). The most common abnormality was tachycardia (23%) and hypertension (8%).

Tables 54 and 55: Clinical vital sign measures in Self-Harming patients.

Pulse Rate	No. Patients
Not recorded	11
<60	9
60-100 (NR)	196
101-150	63
>150	1

RR	No. Patients
Not recorded	31
<10	4
10 to 20 (NR)	216
21-30	28
>30	1

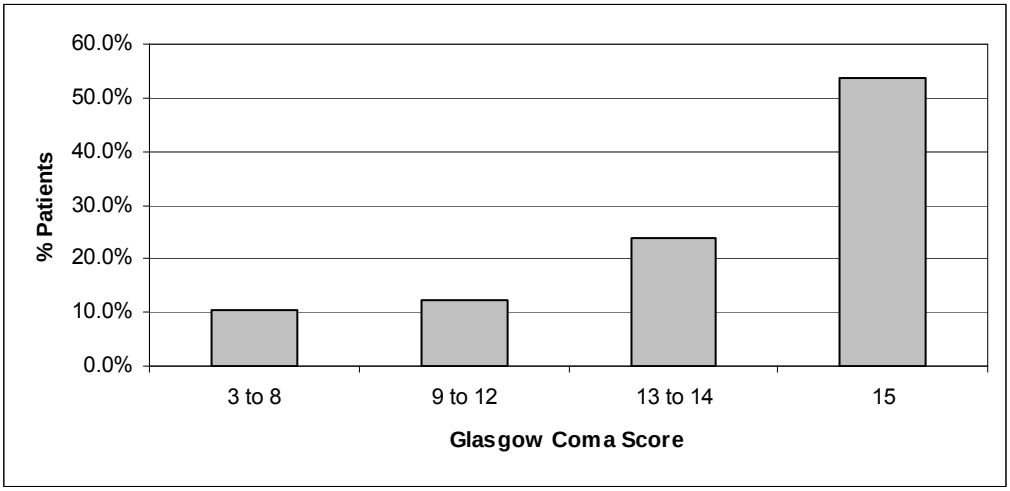
Systolic BP	No. Patients
Not recorded	25
<90	5
90-150 (NR)	227
150-200	22
>200	1

Oxygen Saturation	No. Patients
Not recorded	46
<85	
86-90	3
91-95	34
96-100 (NR)	197

(BP = blood pressure, NR = normal range, RR = respiratory rate)

The GCS allocated to drug users intending Self-Harm is depicted in Figure14. Of the 280 patients in whom this data was collected 9 (3%) had a GCS of 3 reflecting the deepest level of unconsciousness, and 29 (just over 12%) were classified in the range 3 to 8 ('severely' depressed conscious state). These figures are broadly similar to those seen in the Illicit Drug Use group (Figure 11).

Figure 14: Conscious levels of patients as measured by the Glasgow Coma Score (GCS): 3 to 8 (severe), 9 to 12 (moderate), 13 to 14 (mild), 15 (normal).



Disposition from the Emergency Department:
Only 25% of patients presenting intoxicated in association with deliberate Self-Harm were discharged home from the ED (Table 56). This compares with 57% of Illicit Drug Users. Of the 71% who were admitted, 15% required intensive care or a high dependency level care. Again,

this rate was double that for Illicit Drug Users. Ultimately, approximately 85% of patients had been discharged from hospital (by the time of completion of data entry, generally within 2 weeks of enrolment), the same rate as seen for Illicit Drug Users.

The higher rates of admission for this group of patients may in part be explained by the need for psychiatric assessment that cannot easily be performed in the Emergency Department whilst the patient is intoxicated. Four patients died (see details Overview and General results, Clinical Correlates), and one remained in long-term rehabilitation facilities.

Tables 56 and 57: Place to which patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total (%)	Disposition from Hospital	Total (%)
Discharged	69 (25)	Home	237 (85)
Admitted	199 (71)	Absconded	9 (3)
EECU	114 (41)	Psych services	27 (10)
General Ward	41 (15)	SAPOL custody	0
ICU/HDU	42 (15)	Rehabilitation	1
Cardiology	1	Died	4
Psych. Ward	0	Other hospital	
Transferred	7 (2)	Other/Unknown	5 (2)

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit, Psych = Psychiatry)

Summary:

Enrolments:

- 280 drug-positive enrolments (25% of total) presented as a result of drug use in association with deliberate Self-Harm.

Demographics:

- 95%were Caucasian with a much smaller proportion of Indigenous patients than in the Illicit Drug Use category (2.5% of Self-Harm patients compared to 6% of Illicit Drug Users)
- The average age was 34.5 years, with 5% aged under 18 years and 7% aged over 50 years
- The male to female ratio was approximately 3 to 4 except in those aged less than 18 years where the ratio was reversed at 5 male to 2 female

- The day and time of day that patients in this category presented was more evenly spread over the week and the time of day than was seen in Illicit Drug Users
- The venue of drug exposure was almost exclusively at a private residence.

Patterns of Drug Use:

- Benzodiazepines, opioids, antidepressants and antipsychotics were proportionally more common and alcohol, amphetamines, and ecstasy and related drugs proportionally much less commonly found compared to Illicit Drug Users
- The benzodiazepines were the most frequently detected type of drug with 252 positive tests in 164 patients
- Alcohol was detected in 50%, somewhat less than the 63% of Illicit Drug Users, and average blood alcohol levels were lower
- Cannabis (THC) was detected in 14% of patients in the group compared to 27% of Illicit Drug Users
- Codeine was the most commonly detected opiate in this group (59%)
- The most frequently detected psycho-stimulant was methamphetamine (52%)
- A surprisingly high 7 out of 10 patients testing positive to pseudoephedrine were in the Self-Harm group
- Multiple drug use was again a feature with 687 positive drug tests returned from the 280 patients
- 67% tested positive to more than 1 drug compared to 59% in the Illicit Drug Use group.

3.2.3 Drink Spiking

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

Of the 99 patients enrolled into the database as having presented intoxicated or poisoned as a result of Drink Spiking 88 returned blood tests positive for the compounds screened for. It is possible that the enrolments who did not return a positive test and the patient who tested positive only to THC (which is unlikely to have been administered via Drink Spiking), may have been exposed to compounds not included in our panel of tests. For example, LSD testing was only introduced during phase 2 of the study and some known hallucinogens are not included on our panel of tests. However, on review of the clinical data available it is likely that explanations other than acute drug intoxication underlie these presentations. None-the-less, patients presenting to our ED alleging Drink Spiking have a high likelihood of testing positive to one or more of the major drugs of interest.

Demographic details:
Ethnicity:
A somewhat higher proportion of patients in this group were not Caucasian (16% compared to 10% of the Illicit Drug Use group and 5% of the Self-Harm group). Only one Indigenous patient however, presented as a result of alleged Drink Spiking (Table 58).

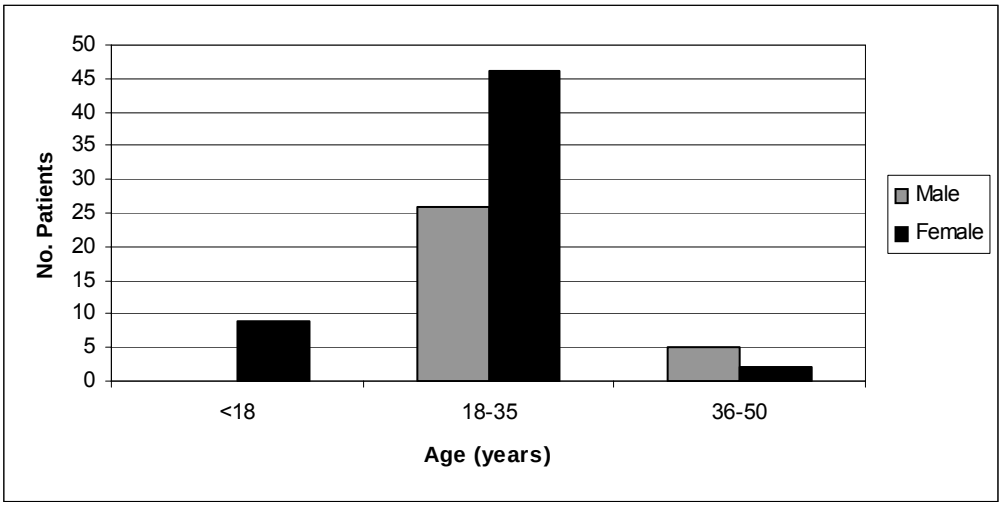
Table 58: Ethnicity and gender distribution of patients presenting as a result of alleged Drink Spiking.

Ethnicity	Male	Female	Total (%)
Caucasian	25	49	71 (84.1)
Indigenous	1	0	1 (1.1)
Asian	2	2	4 (4.5)
Other	3	6	9 (10.2)
Total	31	57	88

Age and Gender:
The average age of patients alleging Drink Spiking (26.8 years of age) was substantially lower than other presentation groups (4 years less than Illicit Drug Users and almost 8 years less than the Self-Harm group). Unlike the other presentation groups there was also a noticeable difference in the average ages of males and females in victims of Drink Spiking (29.2 years for males, 25.4 years for females). Of some concern is the fact that over 10% of patients were under 18 years of age, all of whom were females (Figure 15). The youngest victim of Drink Spiking was a female aged 16 years, who presented before midnight on a Saturday by private car. The venue of exposure was not stated. Her toxicological screen revealed alcohol only with a blood concentration of 0.15g/100mL.

Numbers were too small to allow gender analysis for specific ethnic groups however, the male to female ratio for the group as a whole, was approximately 1:2, the reverse of that seen in the other enrolment groups (Table 58). Interestingly though, the gender ratio reverted to male predominance in the over 35 years of age sub-group, however numbers enrolled were very small (5 males and 2 females) and statistical significance is therefore uncertain. The gender ratio also reverted to male predominance when testing for the presence of drugs other than for alcohol (Table 61).

Figure 15: Age and gender distribution of patients presenting as a result of alleged Drink Spiking.



Time of Presentation:
As was the case for Illicit Drug Users, the most likely time of presentation to the Emergency Department by victims of Drink Spiking was between midnight and 6 am Sunday. The trend observed with illicit drug users to present between 6 pm Friday and 6 am Monday was even more pronounced in Drink Spiking victims (59%, Table 59).

Table 59: Day and time of alleged Drink Spiking presentations to the ED.

Time	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Total (%)
0600-1159	3				1			4 (9)
1200-1759					1	2		3 (7)
1800-2400	3	1				1	2	7 (16)
0001-0559	12	1	1		3	5	8	30 (68)
Total (%)	16 (36)	2 (5)	1 (2)		5 (11)	8 (18)	10 (23)	44

(Phase 2 data only, *n=44*)

Venue of exposure and mode of transport to ED:
The venue of drug exposure was recorded in 54 patients (Table 5). Of these the overwhelming majority occurred in licensed premises (55% in a public bar, and 31% in a nightclub). This

contrasts with both the Self-Harm and Illicit Drug Use groups where the majority of exposures were reported as occurring at a private residence, usually the patient's own home.

Mode of transport to hospital was also somewhat different from other enrolment groups in that a much smaller proportion of victims of Drink Spiking arrived by ambulance (59%, Table 60, compared to 73% of illicit drug users and 76% of the Self-Harm group). This may be due to the lower average level of medical urgency and severity seen in this group when compared to the other groups.

Table 60: Mode of arrival to the ED for patients in the Drink Spiking category.

Mode of Arrival	Number of Patients (%)
Ambulance	26 (59)
Private car	12 (27)
Walked in	3 (7)
Taxi	3 (7)
Total	44

(Phase 2 data only, *n=44*)

Patterns of Drug Use:
A total of 120 positive drug tests were returned from the 88 victims of Drink Spiking giving an average of 1.36 drugs per patient.

Table 61: Gender distribution and number of positive tests for the major drug groups in alleged Drink Spiking.

Drug Type	Male	Female	Total Number of Positive Tests
Alcohol	20	48	68
Amphetamines	17	14	31
Benzodiazepines	5	3	8
THC	5	2	7
GHB	3	1	4
Antidepressants		2	2

Alcohol:
Alcohol was the most common drug detected constituting 57% of the positive drug tests (68 of 120), and 77% of the patients in the group (Table 61). The average blood alcohol level for patients in the group was 0.14 g/100mL (Figure 16), which was somewhat less than that for Illicit Drug Users (0.16 g/100mL). Additionally, no blood alcohol level was greater than 0.25 g/100mL (cf. Illicit Drug Users with 13% and Self-Harm group with 6% of patients with levels > 0.25 g/100mL). Combined with the lower average age seen in victims of Drink Spiking this may support the perception of comparative alcohol naivety in this group.

Alcohol was the sole drug in 57 of the 88 (65%) patients, and was found in combination with other drugs in 11 (Table 62). The drug most commonly found in combination with alcohol was an amphetamine, with MDMA the most common of these.

Figure 16: Blood alcohol levels of alleged victims of Drink Spiking.

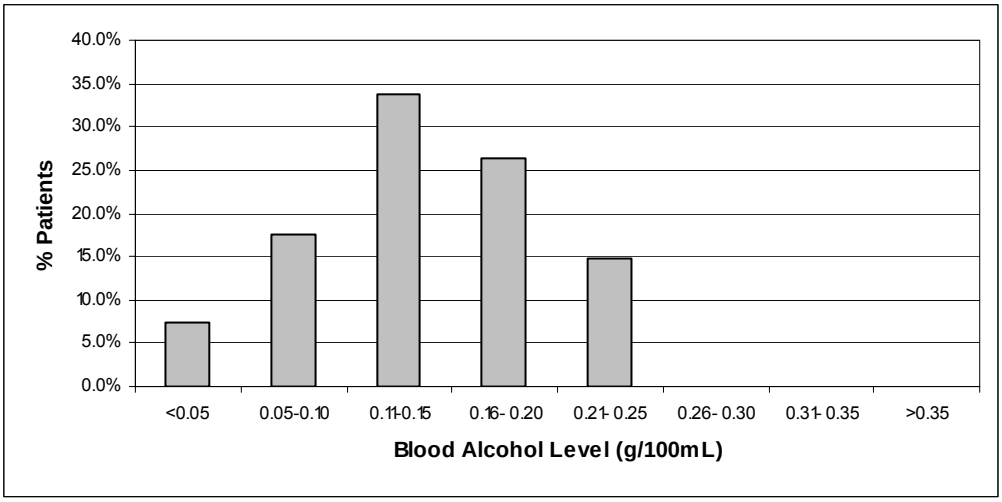


Table 62: Number of patients testing positive to alcohol alone or to alcohol in combination with other drugs.

Drug Combination	Number of Patients
Alcohol total	*68*
Alcohol only	57
Alcohol + MDMA	3
Alcohol + Methamphetamine	1
Alcohol + MDMA + MDEA	1
Alcohol + THC	3
Alcohol + Benzodiazepine	1
Alcohol + Antipsychotic	2

Amphetamines:

Amphetamines (as a group) were detected in 21 of the victims of Drink Spiking (24%) with a total of 28 positive test results (Tables 63 and 64). It is likely however, that there were up to 24 amphetamine doses in the 21 patients; 3 of the patients most likely had more than one psycho-stimulant drug exposure. The specific compound amphetamine was detected in 3 cases, all in association with methamphetamine and it is likely that the presence of amphetamine in these cases was as a result of metabolism of the methamphetamine. Additionally, it is most likely that the MDEA detected in one patient was an additive to the MDMA tablet(s) as this combination has been documented in forensic analysis of tablet seizures and MDEA as a single component has, as yet, not been described in tablets tested in South Australia. The other cases showing multiple amphetamine compounds most likely represent multiple doses containing different drugs, rather than multiple compounds in the one preparation. (See discussion Section 3.3.2. “Amphetamines”).

The highest methamphetamine level detected in the group was 0.5 mg/L (lethal range > 1 mg/L)[30,31]. This patient also tested positive to diazepam at therapeutic levels. The highest MDMA level detected was 0.7 mg/L (lethal range > 0.4 mg/L). This patient had advised staff he had consumed alcohol (4 standard drinks), and snorted cocaine, neither of which were detected.

Table 63: Frequency of psycho-stimulant detection in the Drink Spiking group.

Drug Name	Number of Positive Tests (%)
Methamphetamine	14 (50)
MDMA	10 (6)
Amphetamine	3 (11)
MDEA	1 (4)
Total positive tests	28

Table 64: Number of patients testing positive to psycho-stimulants alone or to psycho-stimulants in combination with other drugs.

Drug Combination	Number of Patients
Amphetamines total	21
Amphetamine (single drug) only: Methamphetamine	2
Amphetamine (group) + Alcohol	7
Methamphetamine/ amphetamine* + diazepam	4
Methamphetamine + GHB	2
Methamphetamine/ MDMA + THC	3
Methamphetamine/ amphetamine* + MDMA	2
Methamphetamine + GHB + MDMA + diazepam	1

(*Amphetamine assumed to be present as a metabolite of methamphetamine)

It is generally believed that the intention of drink spikers is to increase the vulnerability of their victim, generally by sedation. The use of amphetamines for this purpose appears counter-intuitive as their effects are generally stimulatory. This may represent a lack of knowledge of the content of the tablet or powder used or of the effects of the drug by the perpetrator, but it is also possible that amphetamines were deliberately chosen with the aim of disinhibiting the victim. It has been demonstrated that use of psycho-stimulants is associated with increased risk-taking in sexual as well as other behaviours [32]. MDMA in particular, is popularly believed to be associated with lowered sexual inhibitions.

Benzodiazepines:
Benzodiazepines, which are commonly held to be common agents used for Drink Spiking, were only detected in 8 patients (9%, Table 65a). In all but one of the cases the drug detected was diazepam or its principle metabolite nordiazepam. This contrasts with perceptions that the

shorter-acting benzodiazepines such as flunitrazepam (Rohypnol) are typically employed for Drink Spiking. Benzodiazepines were detected in isolation or with alcohol alone, on only 2 occasions, being found most commonly in conjunction with amphetamines (63%, Table 65b).

Table 65a: Frequency of benzodiazepine detection in those alleging Drink Spiking.

Drug Name	Number of Positive Tests (%)
Nordiazepam	7 (88)
Oxazepam	1 (12)
Total positive tests	8

(nordiazepam is the principle metabolite of diazepam)

Table 65b: Number of patients testing positive to benzodiazepines alone or in combination with other drugs.

Drug Combination	Number of Patients
Benzodiazepines total	8
Benzodiazepine (single drug) only	1
Benzodiazepine + Alcohol	1
Benzodiazepine + Methamphetamine/amphetamine*	4
Benzodiazepine + GHB + MDMA + Methamphetamine/amphetamine*	1
Benzodiazepine + antipsychotic	1

(*Amphetamine assumed to be present as a metabolite of methamphetamine)

THC:

THC was detected in 7 patients, representing a detection rate of only 8% in victims of Drink Spiking (Table 66). This compares to detection rates of 15% for patients in the Self-Harm group and 27% in illicit drug users (see Tables 35 & 46). The majority were male (5 male to 2 females). One patient tested positive to THC only whilst the remainder tested positive equally to amphetamines or alcohol.

Table 66: The number of patients testing positive to THC alone or in combination with other drugs.

Drug Combination	Number of Patients
THC total	7
THC (single drug) only	1
THC + alcohol	3
THC + Methamphetamine/amphetamine*	2
THC + MDMA	1

(*Amphetamine assumed to be present as a metabolite of methamphetamine)

GHB:
Four patients tested positive to GHB, representing a detection rate of 4.5% in victims of Drink Spiking (Table 67); this equates to the detection rate of GHB seen in Illicit Drug Users (see Table 35). Of interest was the fact GHB was not found in association with detectable levels of alcohol in any patient in this category, and the majority tested positive to an amphetamine. Again, most patients were male. The patient with the most number of detected drugs also returned the highest level of GHB in the group (233 mg/L, lethal range 140 – 489 mg/L)[31].

Table 67: Number of patients testing positive to GHB alone or in combination with other drugs.

Drug Combination	Number of Patients
GHB total	4
GHB (single drug) only	1
GHB + Methamphetamine/amphetamine*	2
GHB + MDMA + Benzodiazepine + Methamphetamine/amphetamine*	1

(*Amphetamine assumed to be present as a metabolite of methamphetamine)

Opioids:
No opioids were detected in victims of Drink Spiking.

Poly-substance abuse:
Unfortunately, sufficient information regarding which drugs were voluntarily used (and the amount consumed) by alleged victims of Drink Spiking is not available. This makes it difficult to draw firm conclusions regarding some aspects of the drugs used to spike victims' drinks. However, some conclusions on drug use patterns can be drawn with reasonable confidence.

Firstly, it is likely that the majority of patients' drinks are spiked with additional measures of alcohol, as shown by the large majority testing positive to alcohol alone (Table 62). It is possible however, that some patients may have simply underestimated the effects of the drugs they had taken voluntarily. Certainly in the two cases of alleged Drink Spiking that tested positive for THC only, it is likely that this was voluntarily self administered by smoking. A much less likely possibility is that the drug was unwittingly ingested in proffered food.

Secondly, it is likely that poly-substance abuse is less an issue in victims of Drink Spiking than in patients from the other enrolment groups. Although Table 68 shows 31% of alleged victims tested positive to more than 1 drug, it is probable that the second drug was the 'spiking agent' in the majority of these. If this is the case, only 6% of victims of Drink Spiking tested positive to more than willingly ingested drug.

Table 68: Number of victims of Drink Spiking testing positive to 1 or more drugs.

Number of Drugs	Number of Patients (%)
1	61 (69)
2	22 (25)
3	4 (5)
>3	1 (1)
Total	88

Clinical Correlates:
Relevant data on the clinical correlates for patients presenting as a result of Drink Spiking has also been reviewed in "Clinical Correlates" of Section 3.1.

Presenting Complaint:
For those patients in whom the data was recorded (44 patients, phase 2 of the study), the primary reason for attending the ED was related to "drug misuse" (26 patients, (59%); Table 69). No patients had presented as a result of trauma or assault. This is in contrast to data published elsewhere[32] which has indicated a high reported rate (up to 50%) of assault, particularly sexual assault, in victims of Drink Spiking.

Table 69: Primary clinical reason for attending the ED as per presentation complaint.

Presenting Complaint	Complaint Specific	Number of Patients		Presenting Complaint	Complaint Specific	Number of Patients
CVS	collapse-conscious	3		Poisoning	drugs misuse	26
GI	nausea and vomiting	1		Psycho-social	psychiatric illness	1
Neuro	altered conscious state	5		Psycho-social	situational crisis	1
Neuro	headache	1		other		6

(Phase 2 of study only) (CVS = cardiovascular system, GI = gastro-intestinal, neuro = neurological)

Triage Category:
A total of 7 victims of Drink Spiking were assigned the most urgent triage category of 1 (8%). This is the lowest proportion of the various enrolment groups (18% of Illicit Drug Users, 14% of Self-Harm enrolments). These patients however, returned a total of 17 positive drug tests at an average of 2.4 drugs per patient which was slightly more than Illicit Drug Users assigned a triage category 1 (2.08 drugs per patient average). The ratio of drugs per patient in all other triage categories for victims of Drink Spiking was lower than other enrolment groups (range of 1 to 1.4 drugs per patient).

Although an amphetamine was the type of drug most likely to be found in these patients, GHB was the drug most likely to result in the need for immediate medical management with all 4 of the patients testing positive to this drug being given a triage category of 1.

Table 70: Distribution of patient triage priorities according to a positive test for a major drug of interest in those alleging Drink Spiking.

Drug	Triage Priority					Total
	1	2	3	4	5	
Alcohol	3	19	32	14		68
Benzodiazepines	2	3	2		1	8
THC		3	2	2		7
Amphetamines (group)	8	6	8	6		28
Methamphetamine	5	3	2	4		14
Amphetamine		1	1	1		3
MDEA			1			1
MDMA	3	2	4	1		10
GHB	4					4

Clinical Vital Signs:
Data on recorded clinical vital signs is shown in Tables 71 and 72. An abnormal heart rate (rate > 100 (tachycardia) or < 60 beats per minute (bradycardia)) was the most frequently detected abnormal clinical vital sign, although only 5 patients had rates likely to be clinically significant (rate > 150 or < 60 bpm).

Tables 71 and 72: Clinical vital signs measures in victims of Drink Spiking.

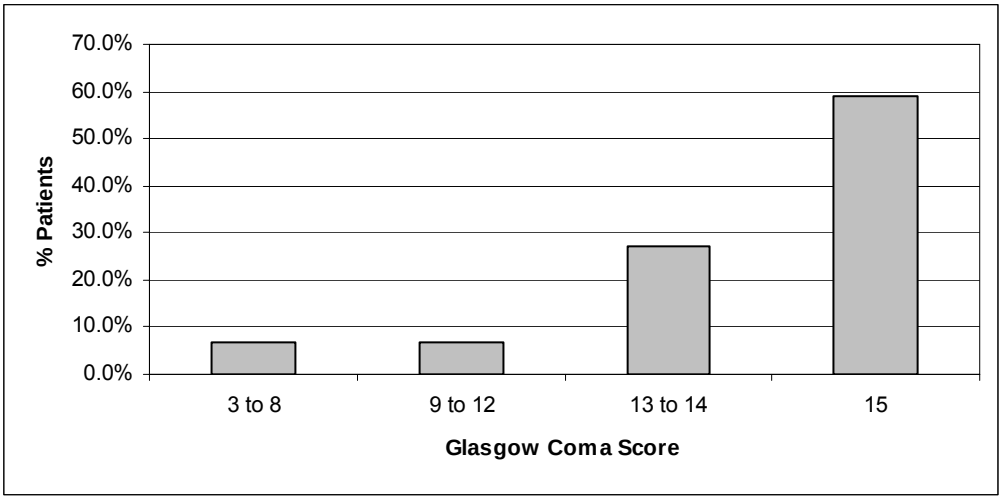
Pulse rate	No. Patients
Not recorded	4
<60	4
60-100 (NR)	49
101-150	30
>150	1
Systolic BP	**No. Patients**
Not recorded	5
<90	3
90-150 (NR)	76
150-200	4
>200	

RR	No. Patients
Not recorded	7
<10	
10 to 20 (NR)	65
21-30	13
>30	3
Oxygen Saturation	**No. Patients**
Not recorded	17
<85	
86-90	
91-95	5
96-100 (NR)	66

(BP = blood pressure, NR = normal range, RR = respiratory rate)

The GCS was recorded in all 88 patients. Just less than 7% recorded scores of 8 or less and a further 7% scored in the range 9 to 12 (Figure 17). Two patients scored a GCS of 3, the lowest possible score, indicating coma with complete unresponsiveness. In broad terms the distribution of GCS for victims of Drink Spiking was similar to that for the Illicit Drug Use and Self-Harm groups.

Figure 17: Conscious levels of patients as measured by the Glasgow Coma Score (GCS): 3 to 8 (severe), 9 to 12 (moderate), 13 to 14 (mild), 15 (normal).



Disposition from the ED:
Approximately 15% of victims of Drink Spiking were admitted to hospital from the ED, the majority of which (9 patients, 11% overall) were admitted to the EECU for overnight observation (Table 73). All patients eventually left hospital, with only 2 patients staying longer than 24 hours.

Tables 73 and 74: Place to which patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total (%)
Discharged	75 (85)
Admitted	
EECU	9 (11)
General Ward	2 (2)
ICU/HDU	2 (2)
Total	88

Disposition from Hospital	Total (%)
Home	86 (98)
Absconded	2 (2)
Psych services	-
SAPOL custody	-
Died	-
Total	88

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit, Psych = Psychiatry, SAPOL = South Australian Police)

Two patients required admission to intensive care. Both cases were male, both tested positive to high levels of GHB (152 mg/L and 233 mg/L, lethal range 140 – 489 mg/L)[30] and to moderate levels of methamphetamine (0.04 and 0.03 mg/L, toxic range 0.2 – 1.0 mg/L)[30]. The second case also tested positive to diazepam and to MDMA in potentially fatal levels (0.63 mg/L, lethal range 0.4 to 0.8 mg/L); despite the presence of diazepam this patient sustained a grand mal seizure. Both cases were comatose and required intubation on arrival to the ED.

Summary:

Enrolments

- There were 88 drug positive enrolled patients who presented as a result of Drink Spiking (8% of drug-positive enrolments).

Demographics

- A higher proportion of patients in this group were not Caucasian (16% compared to 10% of Illicit Drug Users and 5% of Self-Harm)
- The average age was lower than other enrolment groups at 26.8 years; over 10% were under 18 years of age
- The male to female ratio was 1 to 2
- The large majority of drug exposures occurred in a licensed venue (55% in public bar, 31% in a night club)
- A smaller proportion of these patients arrived at the ED via ambulance.

Patterns of Drug Use:

- A total of 120 positive drug tests were returned from the 88 victims of Drink Spiking giving an average of 1.36 drugs per patient
- Alcohol was the drug most commonly detected (77% of patients), followed by amphetamines (24%), benzodiazepines (9%), and THC (8%)
- GHB was detected in 4 patients, never in association with alcohol, but in association with an amphetamine in 3 cases
- 6% of patients tested positive to 3 or more drugs.

3.2.4 Unknown and Suspected Drug Use

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

There were 61 patients of the 1134 (5%) with positive drug screens enrolled where circumstances of drug exposure could not be determined or where drug use was uncertain. The overall severity of illness, as indicated by the clinical correlates data, is greater than for other groups due to the inherent selection bias for this group; the more ill a patient the less likely an accurate assessment of drug use intent will be obtainable, or even if drugs of abuse are involved at all. However, both the demographic patterns and the patterns of drug use shown in the following tables and figures closely match those of the Illicit Drug Use patients, and it is likely the majority of patients in this group presented as a result of Illicit Drug Use.

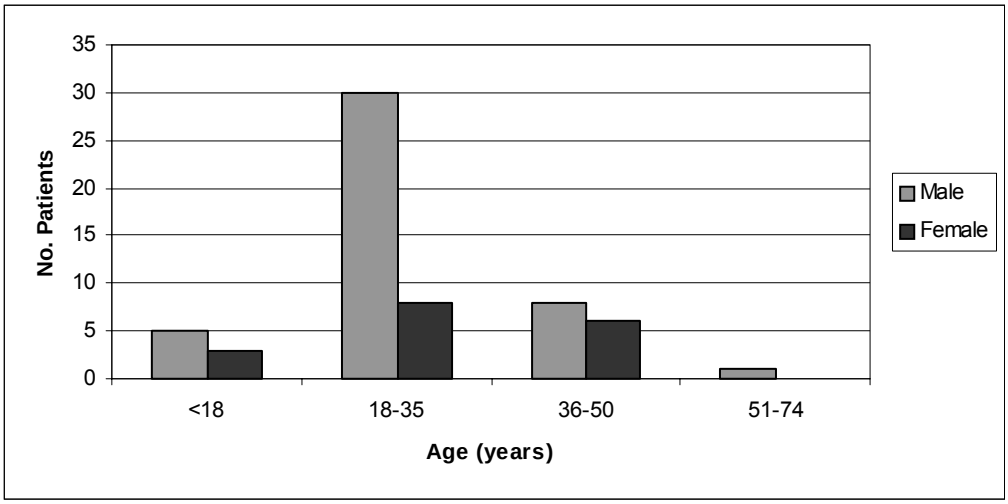
Demographic details:
Ethnicity:
The relative proportion of presentations for the various ethnic groups matches closely that for Illicit Drug Use group (Table 75).

Table 75: Comparison of ethnicity of patients presenting with unknown or suspected drug use and Illicit Drug Users.

Ethnicity	Unknown Total (%)	Illicit Drug Use Total (%)
Caucasian	51 (84)	608 (89)
Indigenous	3 (5)	40 (6)
Asian	2 (3)	9 (1)
Arab	1 (1)	4 (1)
Other	4 (7)	25 (4)
Total	61	687

Age and Gender:
The average age of patients presenting as a result of unknown/suspected drug use was just under 30 years, with only a slight difference between the genders (male average age 29.1 years and female 30.5 years, Figure 18). This compares with an average age of 30.7 years for Illicit Drug Users and 34.4 years for the Self-Harm group. However, whereas just over 5% of Illicit Drug Users were under the age of 18 years, 13% of the unknown/suspected drug use group were under 18 years of age. As with drug positive enrolments generally, there was a male predominance across all age groups with an overall male to female ratio greater than 5 to 2 (cf male to female ratio of 7 to 3 among Illicit Drug Users).

Figure 18: Age and gender distribution.



Time of Presentation:
Enrolment numbers were too small to determine a specific 6-hour time block for the most likely time of presentation to the Emergency Department. However the strong trend to present over the weekend seen in Illicit Drug Users was also evident in the unknown/suspected group (Table 76).

Table 76: Day and time of Unknown and Suspected drug use presentations to the ED.

Time	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Total (%)
0600-1159	1				1		3	5 (16)
1200-1759	2	2	1	2	1	2	1	11 (34)
1800-2400	1	3				3		7 (22)
0001-0559	3	2	1				3	9 (28)
Total (%)	7 (22)	7 (22)	2 (6)	2 (6)	2 (6)	5 (16)	7 (22)	32

(Phase 2 only, *n=32*)

Venue of exposure and mode of transport to ED:
Data on where the drug exposure occurred in this group was almost universally not recorded. Data of mode of arrival was available for 32 of the 61 patients (Table 77), again showing results similar to those for Illicit Drug Users.

Table 77: Mode of arrival to the ED for patients in the Unknown/Suspected categories.

Mode of Arrival	Number of Patients (%)
Ambulance	22 (69)
Police/Custodial	5 (16)
Private car	4 (12)
Walked in	1 (3)
Total	32

(Phase 2 only, *n=32*)

Patterns of Drug Use:

A total of 118 positive drug results were returned from the 61 patients. The detection rates for the major drug groups are shown in Table 78. Broadly speaking there is similarity between the Unknown and Illicit Drug Use groups other than for a proportionally greater use of THC and lower use of alcohol. The average number of drugs detected per person in the Unknown group was 1.93, which compares with 2.08 for the Illicit Drug Use group and 3.00 for the Self-Harm group.

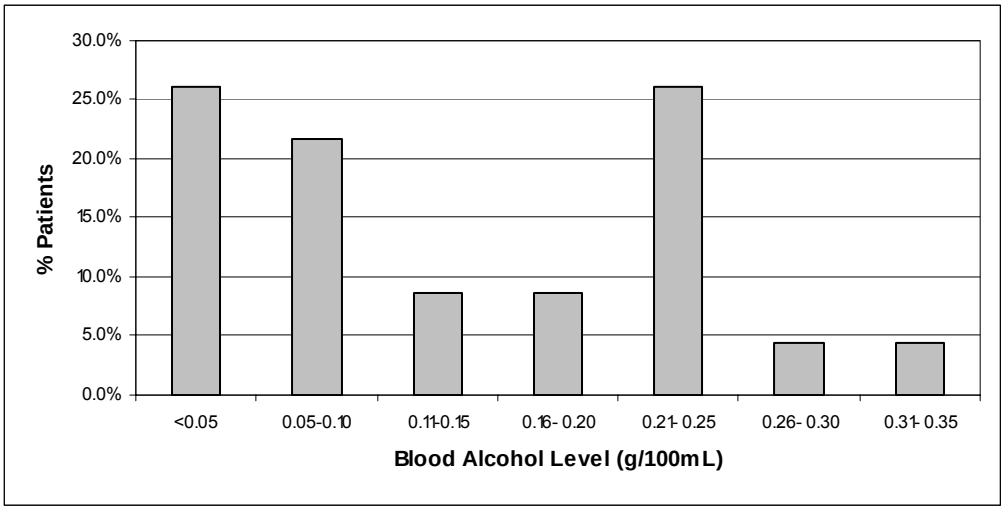
Table 78: Comparison of the number of positive drug tests returned for the major drug groups in the Unknown/Suspected and Illicit Drug Use enrolment categories.

Drug Type	Unknown/Suspected Total No. Positive Tests (%)	Illicit Drug Use Total No. Positive Tests (%)
Alcohol	23 (19)	434 (30)
Benzodiazepines	22 (19)	280 (19)
Amphetamines	25 (21)	266 (18)
THC	26 (22)	184 (13)
Opioids	6 (5)	110 (8)
GHB	1 (<1)	31 (2)
Ketamine	1 (<1)	5 (<1)

(% is the percent of the total number of positive drug results in each category)

The distribution of alcohol levels is shown in Figure 19, and is distinct from that for the other enrolment groups in that the other groups showed a more classic distribution curve across the range. The average blood alcohol level across the group at 0.23 g/100mL was the highest of all the enrolment groups.

Figure 19: Blood alcohol levels of Unknown/Suspected group.



As was the case with Illicit Drug Use enrolments, methamphetamine was clearly the most frequent psycho-stimulant detected, followed by MDMA. As discussed elsewhere, amphetamine (the compound) was generally detected in conjunction with methamphetamine and likely a by-product of metabolism of the latter rather than the administered parent compound.

Table 79: Incidence of detection of amphetamines in Unknown/Suspected patients.

Drug Name	Number of Positive Tests (%)
Methamphetamine	16 (68)
MDMA	4 (16)
Amphetamine	3 (12)
MDA	1 (4)
Total positive tests	24

Apart from 2 cases positive to codeine, methadone (4 cases) was the only other opiate detected in this group. Of the other ecstasy and related drugs only one positive test for GHB and one for ketamine were returned.

Drug Habit:
The history of drug use reported by patients was not well recorded compared to other groups (Table 80).

Table 80: Frequency of drug use reported by Unknown/Suspected drug use patients.

Reported Drug Use	Frequency of Use					Total Responses
	Daily	Weekly	Monthly	Not specified*	Past use only	
Cigarettes	14			1		15
Alcohol	8	1	2	5		16
Cannabis	5	3	3	7		18
Amphetamines	3		1	4		8
Methamphetamine	1	1	2	3		7
Benzodiazepines	2			1		3
LSD/Acid				1		1
Ecstasy			1		1	2
Heroin	1			3	2	6
Mushrooms				1		1

(*Stated drug used but frequency of use not recorded) (data not recorded for all patients)

Clinical Correlates:

Presenting Complaint:

The primary clinical reason for attending the ED was recorded in 28 patients and is shown in Table 81 (Phase 2 data only). The most frequent reason was as a result of trauma (12 patients, 43%), with 7 of these of sufficient severity that criteria for involvement of the hospital Trauma Response Team was met.

Table 81: Primary clinical reason for attending the ED as per presentation complaint.

Presenting Complaint	Complaint Specific	Number of Patients		Presenting Complaint	Complaint Specific	Number of Patients
Drug	drugs misuse	3		Single trauma	blunt- assault	4
Neurologic	altered mental state	1		Single Trauma	hanging	1
	seizure	1		Multi-trauma	fall	2
Psycho-social	hallucinations	2			head injury	1
	social problem	5			MVA	4
	violent behaviour	3		Respiratory	short of breath	1

Phase 2 of study only. (CVS = cardiovascular system, GI = gastro-intestinal, multi-trauma = trauma severity requiring trauma team assessment, single trauma = trauma severity not requiring trauma team assessment, GCS = Glasgow Coma Score (see footnote page 51), apnoea = cessation of breathing, MVA = motor vehicle accident)

Triage Category:
The Unknown/Suspected group had the highest proportion of patients triaged as requiring immediate medical assessment on their arrival to the ED (27%), and over 80% of all patients in this category were triaged to either category 1 or category 2 (most urgent of 5 triage categories; Table 17). As discussed above this likely represents a bias of selection of the most unwell into this enrolment group – the more unwell a patient the less likely a coherent history of events will be obtainable and the more likely they will be enrolled as unknown intent or drug use only suspected. The drugs detected are compared with their allocated triage priority in table 82.

Table 82: Triage priority of patients testing positive to each of the major drug types.

Drug	Triage Priority					Total Patients
	1	2	3	4	5	
THC	7	14	2	2	1	26
Amphetamines	4	8	3		1	16
Alcohol	4	15	2	2		23
Benzodiazepines	3	11	1	2	1	18
Opioids	2	2	1	1		6
Antidepressants	3	3		1		7
GHB			1			1
Ketamine	1					1
Others	2	1		1		4

(Number of patients)

Clinical Vital Signs:
In contrast to the other clinical parameters of illness severity the vital signs for this group of patients showed only similar rates of clinically significant abnormalities in line with other enrolment groups (Tables 83 & 84).

Tables 83 and 84: Clinical vital signs measures.

Pulse Rate	No. Patients
Not recorded	1
<60	3
60-100 (NR)	29
101-150	27
>150	1

RR	No. Patients
Not recorded	5
<10	
10 to 20 (NR)	42
21-30	13
>30	1

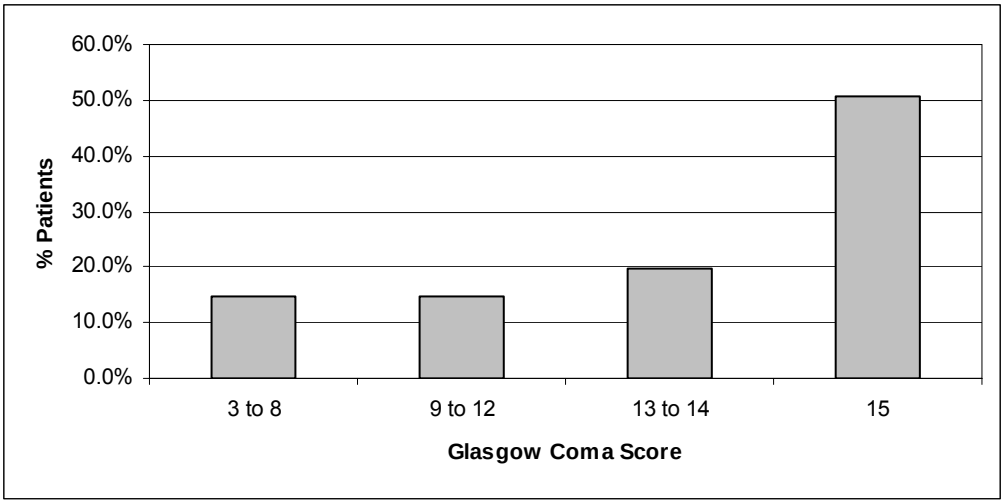
Systolic BP	No. Patients
Not recorded	4
<90	5
90-150 (NR)	40
150-200	12
>200	

Oxygen Saturation	No. Patients
Not recorded	24
<85	1
86-90	
91-95	10
96-100 (NR)	26

(BP = blood pressure, NR = normal range, RR = respiratory rate)

The Glasgow Coma Scores were recorded in all patients and are shown grouped according to clinical severity in Figure 20; the Unknown/Suspected group had the largest proportion of unconscious patients (GCS < 8).

Figure 20: Conscious levels of patients as measured by the Glasgow Coma Score (GCS): 3 to 8 (severe), 9 to 12 (moderate), 13 to 14 (mild), 15 (normal).



Disposition from the ED:

Approximately 70% of the Unknown/Suspected group was admitted to hospital (Table 85). Of these, 14% required intensive care or a high dependency admission. Ultimately, only 39% of patients had been discharged from hospital by the time of completion of data entry (generally within 2 weeks of enrolment). Three patients died (see details page 31), and 3 remained in long-term rehabilitation facilities. A further 8 required ongoing psychiatric care as inpatients.

Tables 85 and 86: Place to which patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total (%)
Discharged	19 (31)
Admitted	
EECU	14 (23)
General Ward	4 (7)
ICU/HDU	14 (23)
Cardiology	
Psych. Ward	3 (5)
Transferred	4 (7)
Unknown	2 (3)

Disposition from Hospital	Total (%)
Home	40 (66)
Absconded	3 (5)
Psych services	8 (13)
SAPOL custody	2 (3)
Rehabilitation	3 (5)
Died	3 (5)
Other hospital	
Other/Unknown	2 (3)

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit, Psych = Psychiatry, SAPOL = South Australian Police)

Summary:

- 61 drug-positive patients were enrolled with insufficient information to determine drug use intent
- Demographic data and patterns of drug use of patients in this category broadly matched that seen in the Illicit Drug Use category.

3.2.5 Other

Enrolments:
The number of patients with positive drug screens who were enrolled as a result of iatrogenic toxicity or due to accidental poisoning was small (2 and 16 patients respectively), and patterns or trends in drug exposure could not be detected.

3.3 RESULTS BY DRUG TYPE

3.3.1 Alcohol

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

More patients tested positive to alcohol than any other drug. Of the 1134 patients returning drug-positive blood tests, 670 (59%) tested positive to alcohol. Although there were more benzodiazepine-positive blood results these were from fewer patients (397 patients 35%, Table 6).

Demographic Details:
Ethnicity:
The distribution of alcohol-positive patients across the ethnic groups was very similar to that seen with Illicit Drug Users generally (Table 26); nearly 90% were Caucasian, 5% Indigenous and just over 2% Asian (Table 87).

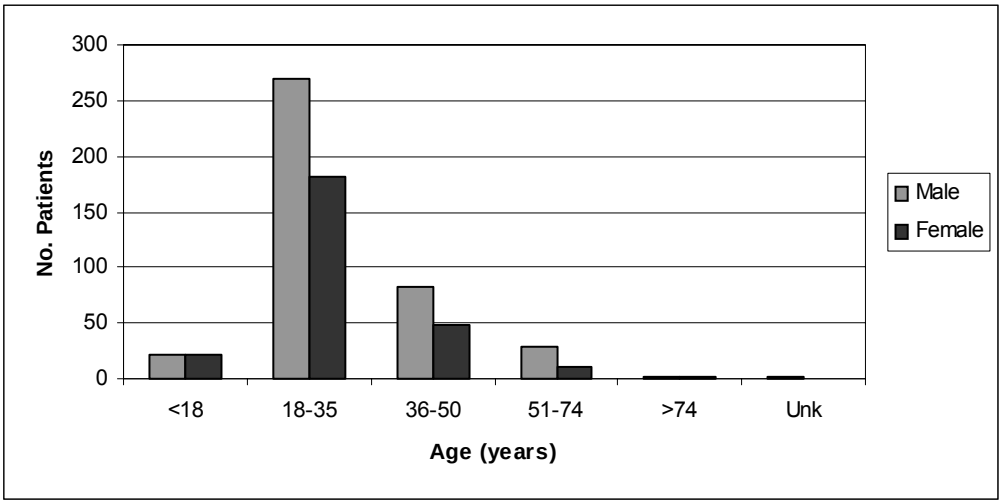
Table 87: Ethnicity of patients testing positive to alcohol.

Ethnicity	Total (%)
Caucasian	591 (88)
Indigenous	31 (5)
Asian	15 (2)
African	1 (<1)
Arab	4 (<1)
Other	31 (5)
Total	670

Age and Gender:
The average age of patients testing positive to alcohol was 31.4 years. This average was somewhat less than that for both opioids (35.6 years) and benzodiazepines (34.2 years), but was older than for all other drug types. There was almost 2 years difference between the average ages of the genders (male average age 32.1 years and female 30.4 years), the largest difference of any of the drug types. Almost 6.5% of patients were under 18 years of age; a proportion similar to that seen with amphetamines, THC and antidepressants.

As with drug positive enrolments generally, there was predominance of males, with a male to female ratio of 3 to 2. This male predominance held across all age groups other than for those under 18 years of age where the gender ratio was 1:1.

Figure 21: Age and gender distribution of patients testing positive to alcohol.



(Unk = unknown)

Time of Presentation:

The most likely time of presentation to the Emergency Department was between midnight and 6 am Sunday. Over half of the presentations (203 of the 365 patients) were between 6 pm Friday and 6 am Monday (Table 27).

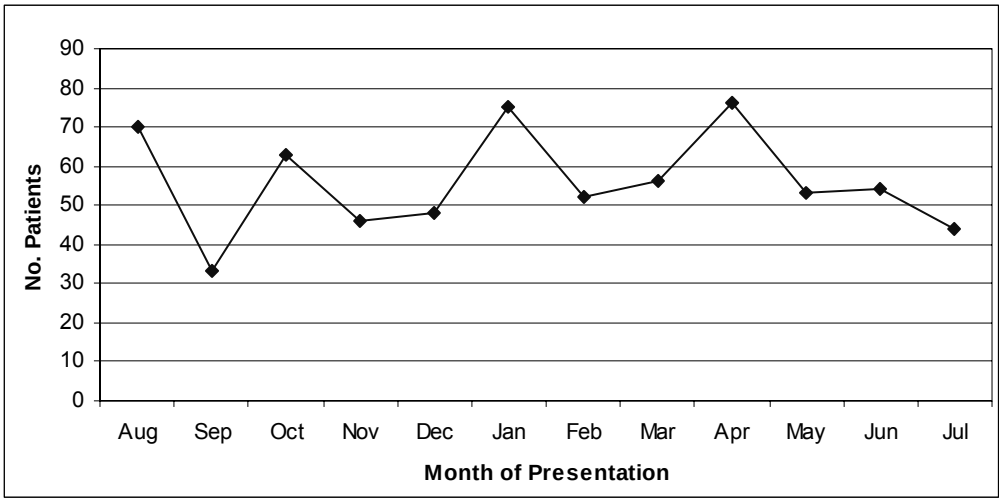
Table 88: Day and time of presentation to the ED of patients testing positive to alcohol.

Time	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Total (%)
0600-1159	12	1	3	3	4	4	7	34 (9)
1200-1759	5	9		4	10	11	7	46 (13)
1800-2400	16	11	10	12	20	33	17	119 (33)
0001-0559	58	12	8	10	19	23	36	166 (45)
Total (%)	91 (25)	33 (9)	21 (6)	29 (8)	53 (15)	71 (20)	67 (18)	365

(Phase 2 data only*: n=365*)

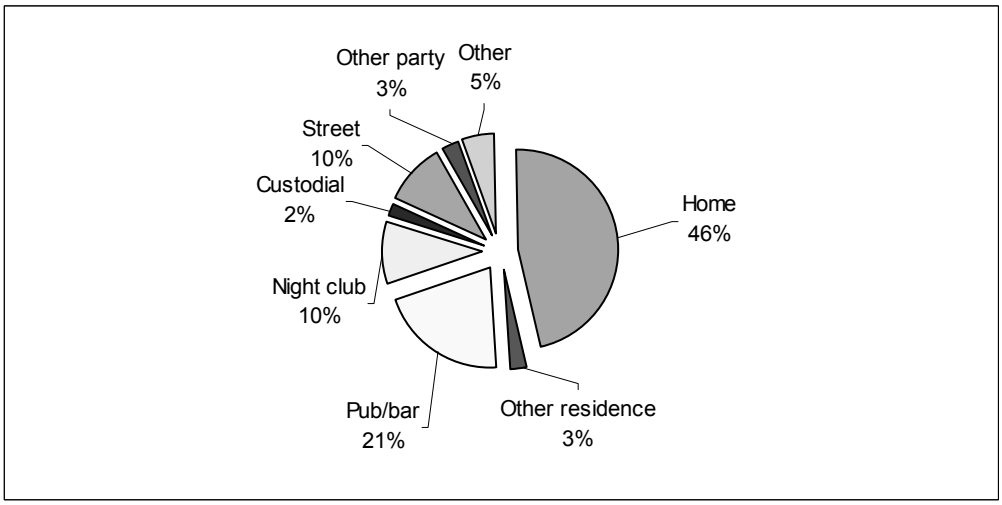
There was considerable variation in monthly enrolments of patients testing positive to alcohol (Figure 22). Although the pattern of enrolment approximates that for enrolments generally (Figure 2), a trend to increased alcohol-related presentations between December and April is suggested by Figure 22.

Figure 22: Alcohol positive patients enrolled per month.



Venue of exposure and mode of transport to ED:
The venue where alcohol exposure occurred was recorded in 391 patients (58%) and is shown in Figure 23. Surprisingly, of these, only 31% of exposures occurred in a licensed premises, whilst almost half were from a private residence, usually the patient's home.

Figure 23: Venue of ingestion of alcohol.



Mode of arrival to the ED was mostly via ambulance services (Table 89). This is broadly consistent with mode of arrival patterns seen in other enrolment categories but is quite different from ED attendances in general. Ambulance and private vehicle transport rates for all patients attending the ED are approximately 41% and 39% respectively, compared to 76% and 11% for alcohol positive enrolments. Similarly, the rate of transport by police or custodial services at 8% is much higher than ED attendances generally at less than 2%.

Table 89: Mode of arrival to the ED for patients testing positive to alcohol.

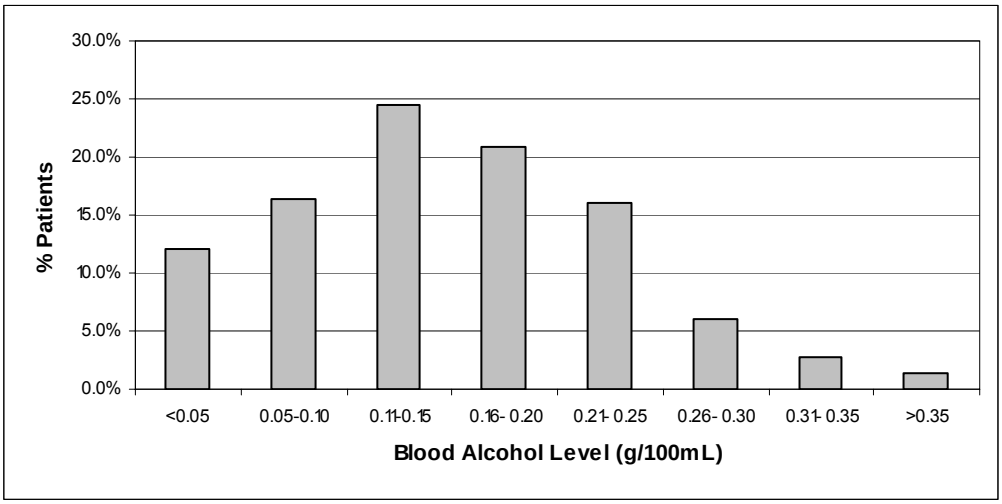
Mode of Arrival	Number of Patients (%)
Ambulance	276 (76)
Police/Custodial	30 (8)
Private car	39 (11)
Walked in	10 (3)
Taxi	8 (2)
Other	2 (<1)
Total	365

(Phase 2 data, *n=265*)

Patterns of Drug Use:

Alcohol was the most commonly detected drug in all presentation categories other than for the Unknown/Suspected category, where THC was marginally more frequent (Table 78). Most alcohol-positive patients were in the Illicit Drug Use category (65%), however, proportionally, the victims of Drink Spiking category had the highest percentage of alcohol positive patients (77% compared to 63% of Illicit Drug Use group and 50% of Self-Harm drug use group).

Figure 24: Distribution of blood alcohol levels among patients testing positive to alcohol.



The average alcohol concentrations differed according to the presentation category (Table 90). Patients enrolled in the “Unknown” drug use category had higher average blood alcohol levels (BAL) than the other categories. However, as previously discussed (“Unknown and Suspected Drug Use,: Enrolments”) this category has an inherent selection bias in that the more ill a patient is, the less likely an accurate assessment of drug use intent will be obtainable, and the more likely they would be enrolled as “Unknown” or “Suspected” drug use. It is likely though, that the majority of these patients’ drug exposure was as a result of Illicit Drug Use.

Victims of Drink Spiking had a relatively high average BAL of 0.14, given their lower average age, and probable lower incidence of chronic alcohol abuse and tolerance when compared to Illicit Drug Users. Clinically, in non-tolerant individuals, this level equates to gross intoxication with difficulty walking, poor balance and coordination.

Table 90: Average blood alcohol levels (BAL) across presentation categories.

Presentation Category	Average BAL (g/100mL)
Unknown	0.23
Illicit Drug Users	0.16
Drink Spiking	0.14
Accidental Poisoning	0.12
Self-Harm	0.12

The highest single blood alcohol level detected was 0.42 g/100mL in an Illicit Drug User. This patient also tested positive to a benzodiazepine at very high levels (see “Clinical Correlates” below). In non-alcoholic patients levels exceeding 0.30g/100mL would generally be expected to result in coma, and levels approaching 0.40g/100mL to result in marked respiratory depression.

Poly-substance detection was a feature of all presentation categories and of all major drug types examined, including those testing positive to alcohol. Only 43% of alcohol-positive patients did not return a positive test for another drug. There was variation between presentation categories with victims of Drink Spiking returning the highest proportion of alcohol-only tests and patients presenting as a result of Self-Harm the lowest (Table 91).

Table 91: Number of patients in each presentation category positive for alcohol only.

Presentation Category	Alcohol Only	Total Alcohol (%)
Drink Spiking	53	68 (78)
Illicit Drug Use	196	434 (45)
Unknown/Suspected	10	23 (44)
Self-Harm	33	139(24)
Total	292	664*

(% is percent of total number of patients in that category)

*does not include Iatrogenic toxicity or Accidental Poisoning

A total of 662 tests positive for drugs other than alcohol were returned from the 670 patients. The detection rates of the major drug groups are shown in Table 92. Benzodiazepines (as a group) were the most common drugs detected, followed by THC, amphetamines (as a group), and opioids.

Table 92: Drugs present in patients testing positive to alcohol.

Drug Detected	Total Number of Positive Tests
Benzodiazepine	248
THC	117
Amphetamines (group total)	90
MDMA	44
Methamphetamine	38
Amphetamine	4
Pseudoephedrine	3
MDEA	1
Opioids (group total)	66
Codeine	33
Morphine	19
Methadone	8
Heroin	2
Dextropropoxyphene	4
Tramadol	5
Cocaine	1
GHB	3
Ketamine	5
LSD	1
Antipsychotic/Antidepressant	61
Kava	1

The very high rate of alcohol being used in conjunction with sedative compounds indicated by this data is of considerable concern. As potent central nervous system depressants benzodiazepines, opioids, GHB, and ketamine would all be expected to compound the adverse effects of alcohol and increase the incidence of coma, and other, related adverse effects.

MDMA was the psycho-stimulant most commonly associated with alcohol, followed closely by methamphetamine. As discussed elsewhere, it is likely that the presence of amphetamine in 4 cases was a result of metabolism of methamphetamine. The higher rates of MDMA detection in alcohol-positive patients is in contrast with patients enrolled generally where the incidence of methamphetamine was twice that of MDMA (179 compared to 94, Table 11). It also contrasts with the popularly held view of limited alcohol abuse amongst the ecstasy and related drugs scene.

A large number of patients returning positive alcohol tests were also taking prescription medication. In addition to the benzodiazepines and prescription opioids, a wide range of antidepressants, antipsychotics, anticonvulsants, and other medications were detected. The potential for adverse drug reactions as a result of interactions between alcohol and most of these medications is well described.

Drug Habit:
The history of drug use reported by patients testing positive to alcohol is shown in Table 93. Although data was only available from a proportion of patients, a comparison of relative detection rates and volunteered usage rates can still be made.

Again, cigarettes and alcohol were the most commonly reported drugs used and their reported use was 'frequent' (daily or weekly). As has been noted previously, the rates of reported use of benzodiazepines was proportionally much less than other substances when compared to the rates of detection (see discussion also "Illicit Drug Use, Drug Habit").

Table 93: Frequency of drug use reported by patients testing positive to alcohol.

	Frequency of Use						
Reported Drug Use	**Daily**	**Weekly**	**Monthly**	**Yearly**	**Not specified***	**Past use only**	**Total**
Alcohol	86	55	4		44	1	190
Cigarettes	58	3	1		6	2	70
Cannabis	16	6	9	1	8	2	42
Amphetamines	6	11	1	2	9		29
Methamphetamine	3	5	4	1	5		18
Benzodiazepines	17	1		1	2		21
Heroin	5	1			9		15
Opioids (other)	3				2		5
MDMA (ecstasy)		4	3	1	5		13
GHB/Fantasy					1		1
LSD/Acid		1		1	2		4
Cocaine				1	4		5
Ketamine				1	1		2
Solvents					3		3
Nitrous/Bulbs					1		1
Amyl/Rush					1		1
Mushrooms				1			1

(*Stated drug used but frequency of use not recorded) (data not recorded for all patients)

The incidence of injecting drug abuse previously documented in case records of patients testing positive for alcohol was relatively low (Table 94). Of these there was a surprisingly high incidence of hepatitis C, particularly in proportion to the number of cases of hepatitis B.

Table 94: Number of patients with previously documented injecting drug use and transmissible viral disease among those testing positive for alcohol.

Behaviour	Self-Harm	Illicit Drug Use	Total (%)
IV Drug Use	3	39	42 (6)
Hepatitis B positive		4	4 (<1)
Hepatitis C positive	2	19	21 (3)
HIV positive		1	1 (<1)

Clinical Correlates:

Medical History:

There were 480 data entries specific to chronic medical or psychiatric illness. Of these over 50% were psychiatric in nature compared to only 12% being chronic medical conditions (Table 95).

The high proportion of psychiatric illness in patients presenting intoxicated as a result of drugs of abuse was highlighted in the examination of the whole data set (Tables 12 & 13). The data concerning those testing positive to alcohol reveals the same patterns: the large majority of patients with an established past history of attempted suicide or a diagnosis of depression presented as a result of deliberate Self-Harm, whereas the majority of patients with a past history of a major psychotic illness (for example schizophrenia) presented as a result of Illicit Drug Use (Table 95 & 96).

Table 95: Incidence of past history of psychiatric, drug abuse/dependency, and chronic medical illness in alcohol-positive enrolled patients.

Recorded Past Medical/Psychiatric Illness	Number of Patients
Psychiatric Illness	262
Drug abuse or dependency	162
Other Significant Medical	56
Total number of recorded entries*	480

(*Patients may have had more than one medical or psychiatric condition. Data was not recorded for all patients enrolled)

Table 96: Incidence of past psychiatric diagnoses recorded for alcohol-positive enrolments.

Past Psychiatric History	Self-Harm	Illicit Drug Use	Other	Total
Schizophrenia	4	17	1	22
Paranoid schizophrenia	4	2	0	6
Bi-Polar Affective Disorder	10	11	1	22
Psychotic Episode	7	10	0	17
Schizoaffective disorder	0	0	1	1
Depression	48	35	6	89
Anxiety	6	15	1	22
Self-Harming	14	6	0	20
Suicide risk/ attempt	12	9	1	22
Personality Disorder	12	13	0	25
Other	6	10	0	16
Total*	123	128	11	262

(*Patients may have had more than one medical or psychiatric condition. Data was not recorded for all patients enrolled)

An established past history of drug abuse was reported in 167 patients who tested positive to alcohol (Table 97).

Table 97: Incidence of past drug abuse diagnoses recorded for alcohol-positive enrolments.

Past Drug Abuse Diagnosis	Self-Harm	Illicit Drug Use	Other	Total
Alcohol abuse	29	69	1	99
Poly-substance abuse	7	19	0	26
Opiate dependence/abuse	1	19	0	20
Chronic THC use	0	2	0	2
Benzodiazepine abuse	7	6	0	13
Antidepressant abuse	7	0	0	7
Total*	51	115	1	167

(*Patients may have had more than one medical or psychiatric condition. Data was not recorded for all patients enrolled)

Presenting Complaint:

The primary clinical reason for attending the ED in patients who tested positive for alcohol was recorded in 364 patients in Phase 2 (Table 98). “Drug overdose” was the most common listed presenting complaint (36%). Of the more specific presentation descriptors, a moderately to severely depressed conscious state (“↓GCS”) was recorded in 70 cases (19%). Presentations as a result of trauma were a feature of alcohol-affected patients with a total of 88 patients (24%) presenting because of injury; 42 of these (11.5% overall) were of sufficient severity to require Trauma Team assessment (“multi-trauma”).

Issues related to psychiatric or social problems were also a common cause of presentation, with violence and injury/trauma sustained as a result featuring prominently (4 “violence”, 1 hanging, 5 other Self-Harm, 2 self inflicted stabbings, and 3 patients brought by police under Section 23 restraint orders due to violent behaviour).

Table 98: Primary clinical reason for attending the ED as per presentation complaint.

Presenting Complaint	Complaint Specific	Number of Patients		Presenting Complaint	Complaint Specific	Number of Patients
CVS	chest pain	3		Poisoning	?spiked drink	2
	collapse	12			OD	133
Drug	other	1			other	9
Endocrine	↑blood sugar	1		Psycho-social	other	4
GI	pain	4			psych illness	8
	vomiting	4			Section 23	3
Muscular	other	1			crisis	11
Neurologic	↓GCS	70			social	1
	seizure	1			violent	4
	weakness	1		Single	laceration	8
Other	intoxicated	1		Trauma	blunt assault	20
Multi-trauma	assault	4			fall	12
	fall	2			hanging	1
	head injury	1			self-harm	5
	MVA	30		Systemic	other	1
	stabbing	4		Respiratory	apnoeic episodes	1
	other	1				

Phase 2 of study only. (CVS = cardiovascular system, GI = gastro-intestinal, OD = overdose, multi-trauma = trauma severity requiring trauma team assessment, single trauma = trauma severity not trauma team assessment, GCS = Glasgow Coma Score (see footnote page 51), apnoea = cessation of breathing, MVA = motor vehicle accident)

Triage Category:

Thirteen percent of patients testing positive for alcohol were assigned the most urgent triage category of 1, indicating a requirement for immediate medical assessment on their arrival to the ED.

Table 99: Distribution of allocated triage categories for alcohol-positive patients in the various presentation categories (number of patients).

Presentation Category	Triage Priority				
	1	2	3	4	5
Self-Harm	24	52	60	5	
Illicit Drug Use	80	146	134	66	8
Accidental Poisoning		1	4	2	
Drink Spiking	3	20	31	14	
Unknown	1	2			
Suspected	3	13	2	2	
Total (%)	111 (17)	234 (35)	229 (35)	88 (13)	8 (1)

Clinical Vital Signs:

Data on recorded clinical vital signs is shown in Tables 100 and 101. An abnormal heart rate (rate > 100 (tachycardia) or < 60 beats per minute (bradycardia)) was the most frequently detected abnormal clinical vital sign (29% of patients). Fourteen patients (2%) had rates likely to be clinically significant (rate > 150 or < 60 bpm). Twenty two patients (3%) were hypotensive (blood pressure < 90) and likely to have been in a shocked state. Signs suggestive of profound depression of respiratory function were seen in 5 patients with a respiratory rate < 10 and 2% of (14) patients with blood oxygen saturation concentrations of less than 90%.

Tables 100 and 101: Clinical vital signs measures in patients testing positive for alcohol.

Pulse Rate	No. Patients
Not recorded	24
<60	10
60-100 (NR)	453
101-150	179
>150	4

RR	No. Patients
Not recorded	37
<10	5
10 to 20 (NR)	538
21-30	81
>30	9

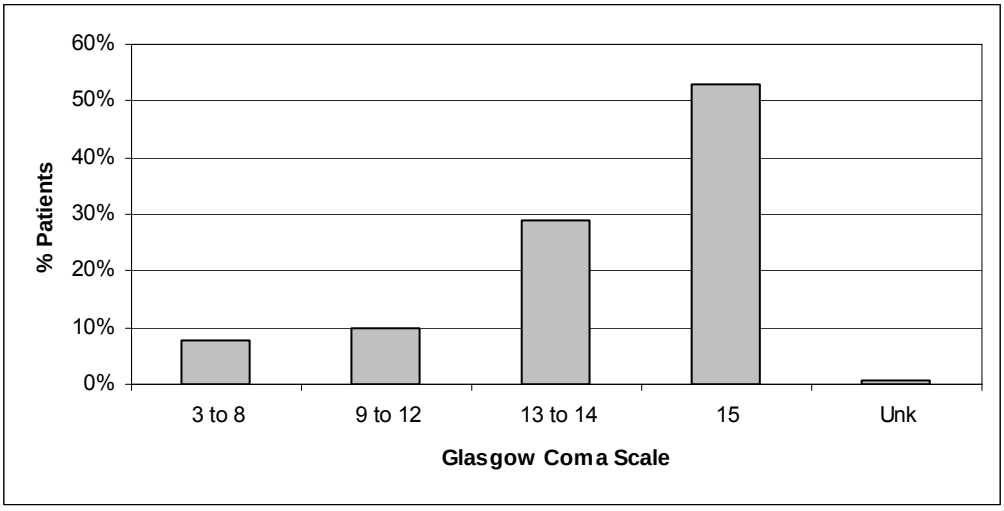
Systolic BP	No. Patients
Not recorded	35
<90	22
90-150 (NR)	564
150-200	49
>200	0

Oxygen Saturation	No. Patients
Not recorded	108
<85	-
86-90	13
91-95	69
96-100 (NR)	480

(BP = blood pressure, NR = normal range, RR = respiratory rate)

The GCS allocated to patients testing positive to alcohol is depicted in Figure 25. Of the 686 patients in whom this data was collected, 13 (2%) had a GCS of 3 reflecting the deepest level of unconsciousness, and 51 (8%) were classified in the range 3 to 8 ('severely' depressed conscious state, generally requiring management of the patients' airway). These figures closely parallel those seen for Illicit Drug Users (Figure 11).

Figure 25: Conscious levels of patients as measured by the Glasgow Coma Score (GCS): 3 to 8 (severe), 9 to 12 (moderate), 13 to 14 (mild), 15 (normal).



(Unk = unknown)

Disposition from the ED:

Approximately 45% of patients testing positive to alcohol were admitted to hospital (Table 102). Of these, 7% required intensive care or a high dependency admission. Ultimately, approximately 96% of patients had been discharged from hospital by the time of completion of data entry (generally within 2 weeks of enrolment). Six patients remained in long-term rehabilitation and 21 in psychiatric in-patient facilities. Once again, a relatively high proportion (5%) of patients left hospital against medical advice (Table 103). Interestingly, none of the enrolled patients who died during the period of the report tested positive to alcohol.

Tables 102 and 103: Place to which patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total (%)
Discharged	366 (55)
Admitted	
EECU	178 (27)
General Ward	63 (9)
ICU/HDU	47 (7)
Cardiology	1 (0)
Psych. Ward	3 (<0.1)
Transferred	7 (1)
Unknown	3 (<0.1)

Disposition from Hospital	Total (%)
Home	600 (90)
Absconded	35 (5)
Psych services	21(3)
SAPOL custody	8 (1)
Rehabilitation	6 (1)
Died	0
Other hospital	0
Other/Unknown	0

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit, Psych = Psychiatry, SAPOL = South Australian Police)

Summary:

Enrolments:

- More patients tested positive to alcohol than any other drug with 670 (59%) of the 1134 patients returning alcohol-positive blood tests.

Demographics:

- 90% were Caucasian, 5% Indigenous and 2% Asian
- The average age was 31.4 years, with females on average 1.7 years younger than males
- 6.5% were aged less than 18 years
- Male to female ratio was 3 to 2, other than for those less than 18 years old where the ratio was 1 to 1
- The most likely time of presentation was between midnight and 6am Sunday
- Over 50% presented between 6pm Friday and 6am Monday
- 49% of alcohol exposures occurred in a private residence compared to 31% in a licensed premise.

Patterns of Drug Use:

- Most alcohol-positive enrolments were in the Illicit Drug Use category (65%), however, proportionally, the victims of Drink Spiking category had the highest number of alcohol positive patients (77% compared to 63% of Illicit Drug Use group and 50% of Self-Harm drug use group)
- Only 43% of alcohol-positive patients did not return a positive test for another drug
- A total of 662 tests positive for drugs other than alcohol were returned from the 670 patients: 248 benzodiazepines, 117 THC, 90 amphetamines, 66 opioids, 61 antidepressants and antipsychotics
- MDMA was the psycho-stimulant most frequently associated with alcohol
- The incidence of injecting drug abuse previously documented in case records of patients testing positive for alcohol was relatively low (6%)
- An established past history of drug abuse was reported in 167 patients who tested positive to alcohol.

3.3.2 Amphetamines

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

Of the 1134 enrolled patients returning positive drug tests, a total of 247 patients (22%) tested positive to amphetamines. This compares with our pre-study estimated detection rate for psycho-stimulants of only 5%. Amphetamines were the fourth most commonly detected drugs after alcohol, benzodiazepines and THC (Table 6).

Demographic Details:
Ethnicity:
The distribution of amphetamine-positive patients across the ethnic groups is shown in Table 104. Over 92% of patients were Caucasian. Although amphetamines were detected in 6 of the 51 Indigenous patients (12%), this represented only 2% of all patients testing positive to these drugs. This was somewhat less than that for THC, benzodiazepines, alcohol, and opioids (Table 105). Amphetamines were the only psychostimulant drug detected in Indigenous patients, and all but 1 were methamphetamine; MDMA was not detected in any Indigenous patient.

Table 104: Ethnicity of patients testing positive to amphetamines.

Ethnicity	Total (%)
Caucasian	228 (92)
Indigenous	6 (2)
Asian	4 (2)
Arab	2 (1)
Other	7 (3)
Total	247

Table 105: Proportional representation of Indigenous patients in each major drug group.

Drug Type	Total No. Patients per Drug Type	No. Indigenous Patients (% of Drug Type)
Alcohol	670	31 (5)
Benzodiazepines	397	24 (6)
THC	259	23 (8.8)
Amphetamines	247	6 (2.4)
Opioids	149	6 (4)
Antidepressants	130	1
Antipsychotics	33	0
GHB/Ketamine/Cocaine/LSD	54	0

Age and Gender:
Just over 6% of patients testing positive to an amphetamine were under 18 years of age. The average age of patients was 27.8 years. This was somewhat less than that for opioids (35.6 years), benzodiazepines (33.5 years), alcohol (31.4 years), and THC (29.3 years) but was similar to that for the ecstasy and related drug types (GHB 27.1, cocaine 26.5, ketamine 24.8,

and LSD 25.6 years). There were also differences in the average ages of patients testing positive for the individual drugs within the amphetamine group (Table 106). Patients testing positive to MDMA (ecstasy) were, on average, more than 2 years younger than those testing positive for methamphetamine and 3 years younger than those testing positive to amphetamine. However, MDMA was as likely to be found in patients under the age of 18 years as methamphetamine (MDMA was positive on 9 occasions compared to 8 for methamphetamine). Use of MDMA (ecstasy) is closely associated with the 'dance party/rave scene' and this data is supportive of the widely held perception that ecstasy users are generally younger than users of the 'traditional' drugs of abuse (e.g. opioids and cannabis). Interestingly, the average age of methamphetamine users lies between the two. However, regular ecstasy users in the PDI sample report use of methamphetamine as regularly as they use MDMA. Further, the apparent difference between MDMA and methamphetamine average ages in this sample of attendees to the ED may not be evident if drug user groups were more clearly separated (as we see in the PDI sample versus the IDRS sample). It may be that we are seeing the more naïve end of the MDMA users among the 'dance party/ rave' population, and the methamphetamine users are a mix of both the 'dance party/ rave scene' users and 'traditional' (IDU etc) users.

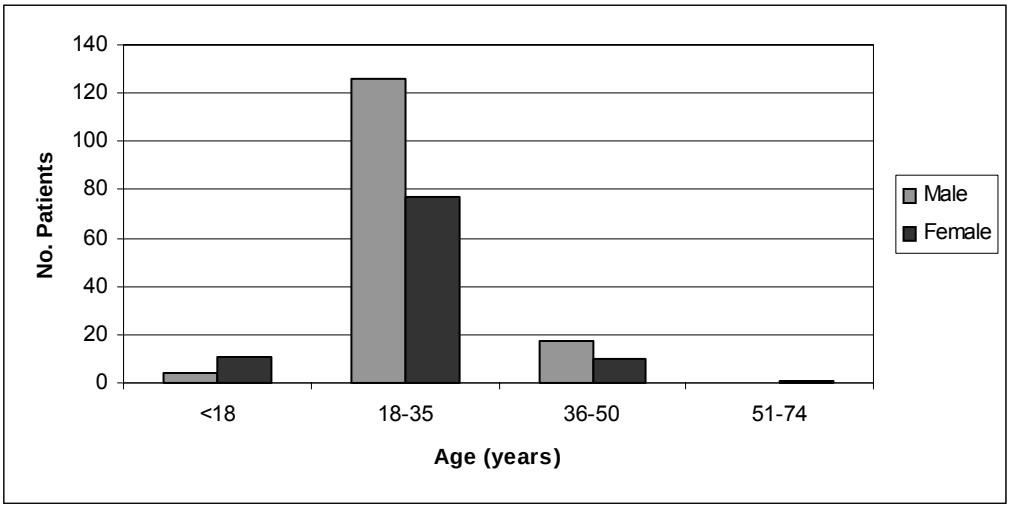
Table 106: Average age of patients testing positive for amphetamines.

Drug Type	Average age (years)		
	Male	Female	All
Amphetamines (Group)	28.1	27.4	27.8
Amphetamine	30	28.8	29.4
Methamphetamine	28.9	28	28.4
MDMA	26.5	25.3	26

There was little difference between the average ages of the genders (male average age 28.1 years and female 27.4 years) for psycho-stimulants users generally or for the specific drugs within the type.

As with drug positive enrolments generally, there was a male predominance with a male to female ratio of 3 to 2. This male predominance held across all age groups other than for those under 18 years of age where the gender ratio was reversed.

Figure 26: Age and gender distribution of patients testing positive to amphetamines.



Time of Presentation:

The most likely time of presentation to the ED was between midnight and 6 am Sunday (Table 107). The proportion presenting between 6 pm Friday and 6 am Monday (84 of 138 patients in Phase 2, (61%)) was greater than that seen for Illicit Drug Users as a whole (48%, Table 27).

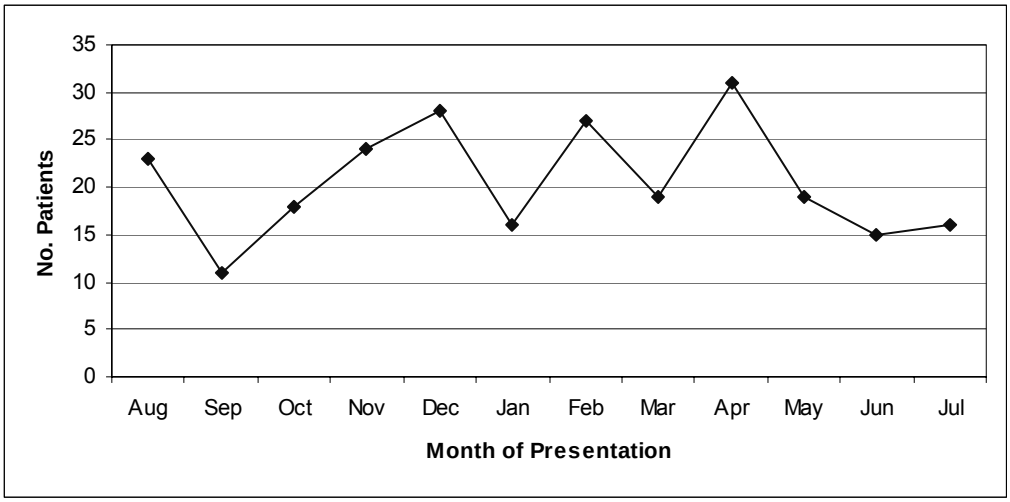
Table 107: Day and time of presentation to the ED of patients testing positive to amphetamines.

Time	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Total (%)
0001-0559	17	5	1	1	5	7	13	49 (36)
0600- 1159	14	5	1	2	1	3	9	35 (25)
1200-1759	6	5	3	1	1	3	4	23 (17)
1800-2400	3	1	4	4	6	5	8	31 (23)
Total (%)	40 (29)	16 (12)	9 (7)	8 (6)	13 (9)	18 (13)	34 (25)	138

(Phase 2 data only: *n=138*)

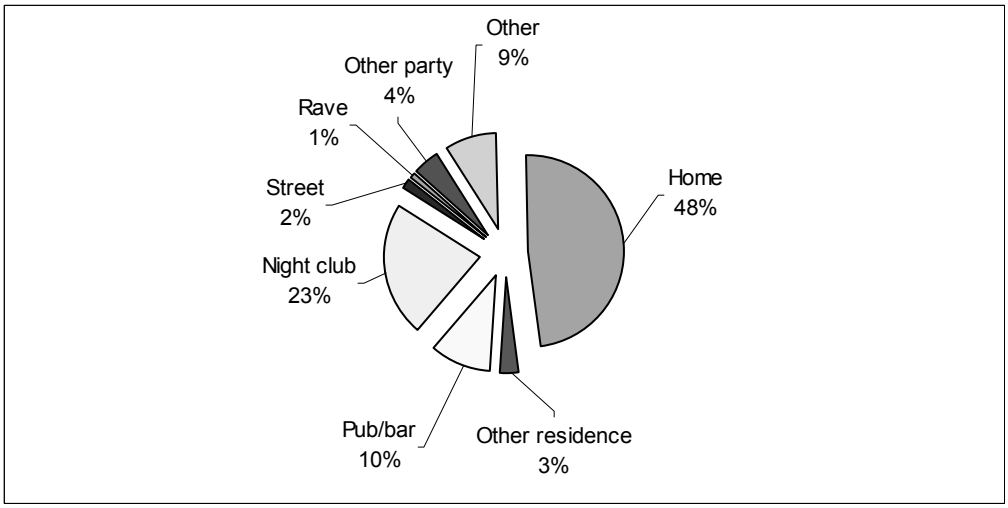
There was some variation in monthly enrolments of patients testing positive to amphetamines (Figure 27). Although the pattern approximates that for enrolments generally (Figure 2), there is a trend to increased amphetamine-related presentations between December and April (The summer period), similar to that seen with alcohol-related presentations.

Figure 27: Number of patients testing positive to an amphetamine enrolled per month.



Venue of exposure and mode of transport to ED:
The venue of amphetamine exposure was recorded in all 247 patients and is shown in Figure 28. Over 50% of exposures occurred in a private residence, usually the patient's home, whilst only 33% occurred in a licensed premises; a pattern seen with Illicit Drug Users generally.

Figure 28: Venue of exposure to amphetamines.



A detailed break-down of venue of exposure according to specific drug revealed a substantial difference between MDMA and methamphetamine/amphetamine (Table 108). In keeping with the perception of MDMA (ecstasy) being associated with the 'dance party/rave scene', only 22% of MDMA exposures occurred at a private residence compared to 62% for methamphetamine/amphetamine exposures. Conversely, 63% of MDMA exposures occurred at a licensed venue compared to 27% for methamphetamine/amphetamine exposures.

Table 108: Venue of drug exposure for patients testing positive to an amphetamine.

Drug	Home	Other Residence	Pub/bar	Night Club	Street	Rave	Other Party	Other
Amphetamine	19	3	4	9			4	
Methamphetamine	59	3	7	16	3		4	4
MDMA	16		12	33	1	3	2	5
Pseudoephedrine								4
Ephedrine								4
MDA				1				2
MDEA					2			

(data not recorded for all patients)

Mode of transport to the ED was mostly via ambulance services (Table 109). This is broadly consistent with mode of arrival patterns seen in other study enrolment categories but, as previously indicated, is considerably different from ED attendances in general, with a greater proportion transported via ambulance (64% compared to 41%) and by police or custodial services (6% compared to < 2%).

Table 109: Mode of arrival to the ED for patients testing positive to amphetamines.

Mode of Arrival	Number of Patients (%)
Ambulance	89 (64)
Police/Custodial	8 (6)
Private car	28 (20)
Walked in	7 (5)
Taxi	6 (4)
Total	138

(Phase 2 data only, n=138)

Patterns of Drug Use:

Amphetamines were detected in 247 patients, the fourth highest number of drug-positive patients (22% of drug-positive enrolments) after alcohol, benzodiazepines, and THC (Table 6). This rate of detection is considerably higher than our pre-commencement estimate of 5% of enrolments based on data from the review by the Hazardous Substances Section of the Environmental Health Service of South Australia on poisoning cases assessed at the RAH 2002[10] (see "Methods: Outcome Measures"). In comparison 90% of regular ecstasy users (REU) in the PDI sample, and 71% in the IDU group recent use[15,16], however, caution should be used when extrapolating this data to rates of use in the general community as there is likely a degree of enrolment bias; it is probable that psycho-stimulant users are more likely to present to an ED for assessment and management compared to users of other drug types (see also Section 3.1. "Overview and Combined Results, Patterns of Drug Use").

The large majority of amphetamine-positive patients were in the Illicit Drug Use category (77%, Table 110). However, the proportion of victims of Drink Spiking testing positive to amphetamines was not much less than that for Illicit Drug Users (24% compared to 28%, Table 111). As discussed in Section 3.2.3. "Drink Spiking: Patterns of Drug Use" the use of

amphetamines by perpetrators of this crime appears initially counter-intuitive to the presumed intent of sedation of the victim. It is possible, however, that the intent is to 'dis-inhibit' the victim rather than sedate, and therefore the choice of drug may be deliberate. It is also possible that the drug was knowingly consumed by the victim in a small number of cases.

It is likely that the majority of patients in the Unknown/Suspected enrolment group were presenting as a result of Illicit Drug Use. (See Section 3.2.4. "Unknown and Suspected Drug Use").

Table 110: Number of patients testing positive to amphetamines enrolled in each presentation category.

Presentation Category	Number of Patients (%)
Illicit Drug Use	191 (77)
Drink Spiking	21 (9)
Self-Harm	19 (8)
Suspected/Unknown	16 (6)
Total	247

Table 111: Comparison of the percentage of patients in each presentation category testing positive to amphetamines.

Presentation Category	Amphetamine positives as % of Presentation Category
Illicit Drug Use	28%
Drink Spiking	24%
Self-Harm	7%
Suspected/Unknown	26%

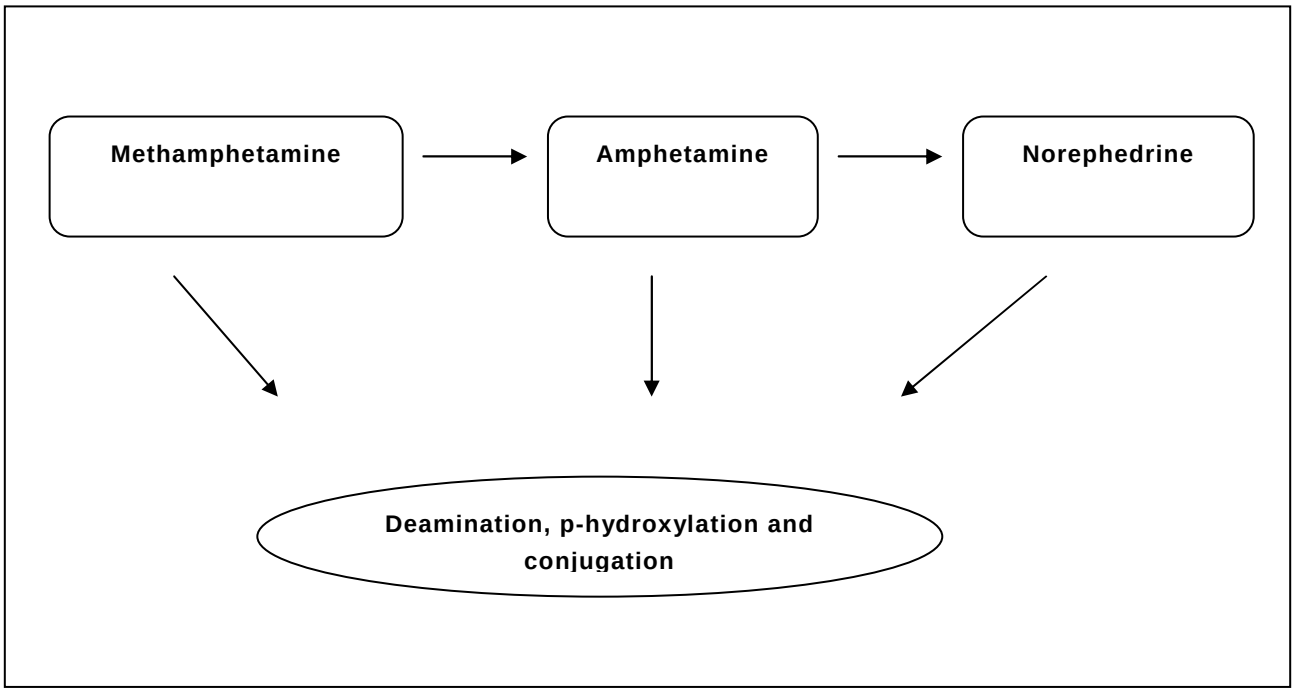
Poly-substance abuse:
A total of 341 drug tests positive for amphetamines were returned in the 247 patients at an average of 1.38 amphetamines per patient (Table 112). The most commonly detected drug was methamphetamine, both overall (53%) and in each of the enrolment groups. MDMA was the next most frequently detected amphetamine. Although most MDMA was seen in Illicit Drug Users, detection rates were proportionally greater in the Drink Spiking group (29% of psycho-stimulant-positive tests in Illicit Drug Users versus 36% in victims of Drink Spiking).

Table 112: Number of positive tests for psycho-stimulants in each presentation category.

Drug Name	Presentation Category				Total (%)
	Self-Harm	Illicit Drug Use	Drink Spiking	Unknown	
Methamphetamine	12	137	14	16	179 (53)
MDMA	3	77	10	4	94 (28)
Amphetamine	1	44	3	3	51(15)
Pseudoephedrine	7	3			10 (3)
MDA		2		1	3 (1)
Ephedrine		2			2 (1)
MDEA		1	1		2 (1)
Total	23	266	28	24	341

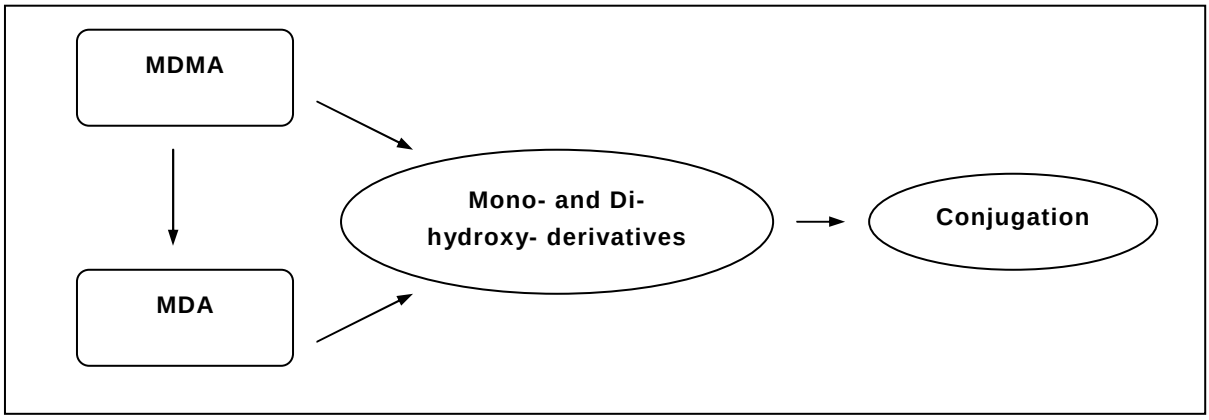
The specific compound, amphetamine, was detected in 51 cases. In all but 3 cases it was found in combination with methamphetamine. The question arises as to whether the amphetamine was present as a result of metabolism of the methamphetamine or whether it was a constituent of the ingested or injected drug. (See Figure 29) Quantitative analysis revealed the levels of amphetamine detected were higher than those of methamphetamine in only 2 of these cases, suggesting the former. Additionally, although forensic analysis of drugs seized by South Australian police indicate high rates of impurities, cutting agents and combinations with other drug types (e.g. ketamine, caffeine) in the illicit, 'home made' amphetamine preparations, the major parent compounds of amphetamine, methamphetamine and MDMA have not been found combined in the same formulation[33]. It is therefore highly likely that the presence of amphetamine in the majority of these cases was as a result of metabolism of the methamphetamine, and the number of cases where amphetamine was the parent compound ingested or injected may be as few as 5.

Figure 29: Metabolism of Methamphetamine.



It is most likely that the MDEA detected in one patient was an impurity in the MDMA tablet(s), as this is not a product of MDMA metabolism (See Figure 30) and this combination has been documented in forensic analysis of tablet seizures. Furthermore, MDEA, as a single component has, as yet, not been described in tablets tested in South Australia, making separate exposure to the 2 compounds unlikely. MDA is a metabolite of MDMA and was associated with MDMA in all cases in this dataset[33].

Figure 30: Metabolism of Methylenedioxymethamphetamine (MDMA).



Beyond these exceptions, it is likely that the other cases positive for multiple amphetamine compounds represent separate doses of the different drugs, rather than multiple compounds in the one preparation. The combinations of amphetamines detected are shown in Table 113.

Table 113: Incidence of the combinations of psycho-stimulant detected in patients.

Drugs Detected	Number of Patients (%)
Methamphetamine only	100 (40)
MDMA only	52 (21)
Amphetamine only	3 (1)
Pseudoephedrine only	6 (2)
Methamphetamine + MDMA	27 (10)
Methamphetamine + Amphetamine	47 (19)
Methamphetamine + Pseudoephedrine	2 (1)
Methamphetamine + Amphetamine + MDMA	4 (2)
MDMA + Ephedrine + Pseudoephedrine	1 (<1)
MDMA + Phentermine	1 (<1)
MDMA + MDEA	1 (<1)
MDMA + Methamphetamine + MDA	1 (<1)
MDMA + Ephedrine + Pseudoephedrine + MDA	1 (<1)
MDMA + Methamphetamine + MDEA + MDA	1 (<1)
Total	247

As has been previously highlighted, poly-substance abuse was a feature of all enrolment categories and of all major drug types examined, including those testing positive to amphetamines. In addition to the 341 tests positive for the amphetamines, there were 304

tests positive for other drugs among this group of amphetamine users, of which benzodiazepines, alcohol, and THC were the most frequently detected (Table 114). The proportion of patients testing positive for GHB who also tested positive to an amphetamine was particularly high (22 of 36 (61%)).

Forensic analysis of tablets seized by police has, in recent times, shown a reasonable detection rate of ketamine as an additive[5]. Our data shows only 2 cases where ketamine was detected in conjunction with an amphetamine. Unfortunately, we are not able to give an indication of the likelihood of them being co-ingestants or separately administered.

Table 114: Incidence of other drugs present in patients testing positive to amphetamines.

Drug Detected	Total Number of Positive Tests
Benzodiazepine	79
Alcohol	77
THC	64
Opioids	26
Codeine	12
Morphine	8
Methadone	6
Cocaine	4
GHB	22
Ketamine	2
LSD	2
Antipsychotic/Antidepressant	15
Others	13

Drug Levels:
There was some variation in the average blood levels for the amphetamines between the presentation groups (Table 115). Generally, the higher levels were seen in Illicit Drug Users. The exception was MDMA where the highest average levels were seen in victims of Drink Spiking. Additionally, the highest recorded blood level of methamphetamine was recorded in an alleged victim of Drink Spiking (Table 116).

Table 115: Average blood drug levels for each of the major amphetamines within the group and for each presentation category.

Drug	Presentation Category			
	Self-Harm	Illicit Drug Use	Drink Spiking	Unknown
Amphetamine	0.03	0.05	0.03	0.03
Methamphetamine	0.06	0.11	0.11	0.09
MDMA	0.27	0.37	0.43	0.35
Ephedrine		0.04		

(Concentrations all in mg/L)

The highest blood level of methamphetamine recorded was 0.5 mg/L in a Caucasian female aged in her early 20s. This level is well within the potentially toxic range (Table 116). The patient presented between midnight and 0600 on a Sunday as a result of alleged Drink Spiking. Transported by private car from an unknown venue, she was given a triage category of 3 on arrival. Her vital signs were normal as was her GCS. The specific drug she had been exposed to was unknown and she was enrolled as "Unknown/Suspected" drug exposure. Blood drug analysis also tested positive for amphetamine (probably as a metabolite of the methamphetamine) and nordiazepam in therapeutic levels. She was discharged to home from the ED within 24 hours of arrival.

The highest recorded level of MDMA was 1.8 mg/L, also well above the potentially toxic threshold. The patient was Caucasian, female, and aged in her late 30s. She presented via ambulance late on a Friday evening from a public outdoors music event following ingestion of 4 tablets (self-administered). On arrival she was noted to be sweaty, tachycardic (heart rate 133), and hypothermic (temperature 34.4ºC) and was given a triage category of 2 (urgent). Her GCS was 15. She also subsequently tested positive for MDA, pseudoephedrine and ephedrine and; although reporting alcohol ingestion none was detected. She was admitted to the EECU and discharged to home within 24 hours.

The highest level of amphetamine was 0.3 mg/L, again above the potentially lethal threshold. A man in his late 30s, he was brought by ambulance following a collapse. He was given a triage category of 1 on arrival and required a medical resuscitation team assessment. It was reported that he had had an overdose of GHB; the amphetamine exposure was not reported. He subsequently tested positive to toxic levels of GHB (145 mg/L, toxic range > 80 mg/L), and therapeutic levels of methamphetamine. He was discharged from the ED after a period of observation.

Table 116: Highest detected blood drug levels of the amphetamines with therapeutic and toxic ranges.

Drug	Blood Level	Therapeutic Range	Toxic Range
Methamphetamine	0.5	0.01 – 0.05	>0.2 (L > 2)
Amphetamine	0.3	0.05 – 0.15	>0.2 (L > 0.5 - 1)
MDMA	1.8	0.1 – 0.35	>0.35 (L > 0.4 – 0.8)
Pseudoephedrine	3.0	0.5 – 0.8	L > 19

(Concentrations all in mg/L. L = lethal levels. All ranges referenced from The International Association of Forensic Toxicologists, internet listing of Therapeutic and Toxic Drug Levels)

Drug Habit:

The history of drug use reported by patients testing positive to amphetamines is shown in Table 117. Although data was only available from 190 patients (77%), a comparison of relative detection rates and volunteered usage rates can still be made. The proportional representation of the major drugs shown in this table closely matches those for the various enrolment categories generally (Tables 34, 51, 80) as well as across the various drugs of abuse.

Cigarettes and alcohol were the most commonly reported drugs used and their reported use was 'frequent' (daily or weekly). Benzodiazepine abuse, once again, was reported relatively

infrequently compared to the actual rates of detection. Similarly, rates of detection for GHB were higher than reported rates of use, especially when compared to the other drug types.

Reported use of the amphetamines was relatively evenly divided between methamphetamine and MDMA. The high reported use of 'amphetamine' compared to the relatively low rates of detection may be due either to patients using the term generically or to a lack of precise knowledge of what it is they are taking. Of those patients reporting abuse of amphetamines almost half (45.7%) reported regular use on a daily or weekly basis.

Table 117: Frequency of drug use reported by patients testing positive to amphetamines.

	Frequency of Use							
Reported Drug Use	**Never**	**Daily**	**Week**	**Month**	**Year**	**Not specified***	**Past use only**	**Total Responses**
Alcohol	1	36	68	15		15		135
Cigarettes		97	5	2	2	1		107
Amphetamines		21	35	11	2	24		93
Cannabis		29	17	16	1	14	2	79
Methamphetamine		8	12	15	1	12		48
MDMA (ecstasy)		1	7	13	3	19		43
Benzodiazepines		9	4	2	1	9		25
Heroin		4	3	1	2	13	2	25
GHB/Fantasy		1	2	3	1	4		11
Cocaine			1	1	2	3		7
Ketamine				1	2	4		7
LSD/Acid				2		3	1	6
Mushrooms					1	2		3
Nitrous/Bulbs						2		2
Amyl/Rush						2		2

(*Stated drug used but frequency of use not recorded. *n* = 190) (data not recorded for all patients)

The incidence of injecting drug abuse previously documented in case records of patients testing positive for an amphetamine was surprisingly high (32% of patients, Table 118). Of these there was also a high incidence of hepatitis C (9% of all psycho-stimulant-positive enrolments), particularly in proportion to the number of cases of hepatitis B (1%).

Table 118: Number of patients with previously documented injecting drug use and transmissible viral disease, among patients testing positive for amphetamines.

Behaviour	Number of Patients
IV Drug Use	79
Hepatitis B positive	3
Hepatitis C positive	23
HIV positive	1

Pill Descriptors:
Although details of the tablets ingested were only infrequently recorded, results of blood drug concentrations obtained in the 15 cases where descriptions were given are shown in Table 119. The large majority of these pills contained MDMA however, 2 contained methamphetamine and in one case only alcohol was detected. Once again the dangerously high levels of MDMA detected is highlighted, with 7 of the 12 patients having levels in the potentially lethal range. In the instance of the “Purple Mitsubishi” ingestion, a potentially lethal MDMA concentration of 0.72mg/L was recorded despite the patient taking only half a tablet.

Although the other tablet descriptors are known to be in circulation in Adelaide, we are not aware of “XJ” labelled tablets having been previously described here. It is possible that it has recently been introduced, perhaps from Perth or Auckland where it has been reported, however, it is also possible that a “JK” labelled tablet was misread (upside down perhaps).

Table 119: Qualitative and quantitative blood test results of patients from whom an accurate tablet description was given.

Logo	Where consumed	Colour	Result	Level detected in patient sample
Pink Lady	Pub/bar	Pink	MDMA	0.48
Blue New York	Pub/bar	Blue	MDMA	0.08
Blue New York	Night club	Blue	MDMA	0.25
Mitsubishi	Night club	White	MDMA	0.44
Mitsubishi	Night club	White	MDMA	0.33
Red Mitsubishi	Unknown	Red	MDMA	0.64
Red Mitsubishi	Night club	Red	MDMA	0.16
Purple Mitsubishi	Night club	Purple	MDMA	0.72
Mitsubishi, Jaguar	Other party	White	Methamphetamine	0.06
unknown		Pink	Methamphetamine	0.05
unknown		Pink	MDMA	0.44
JK	Night club	Unknown	MDMA	0.72
XJ	Other party		MDMA	0.60
XJ	Other party		Alcohol	0.01
bird	Night club	Orange	MDMA	0.44

(Concentrations in mg/L)

A further feature of the data presented in Table 119 is the very broad range in blood concentrations obtained. This is no doubt, multi-factorial with differences in ingestion time to blood sampling, and differences in the number of drugs taken over a variable period of time. However, it is also known from forensic testing of seized pills that the drug content varies

dramatically between the pills, and it is likely the large ranges in drug concentrations seen in Table 119 also reflect this fact. This data suggests that introduction of a pill with high MDMA content, such as the “Purple Mitsubishi”, to an unsuspecting population of users familiar with dosing characteristics of a much lower content pill (eg “Red Mitsubishi”) could easily prove fatal, particularly in a situation of increasing “pill bingeing”.

Clinical Correlates:
Relevant data on the clinical correlates for patients testing positive for amphetamines has also been reviewed in “Clinical Correlates” of Section 3.1.

Medical History:
There were 128 data entries specific to chronic medical or psychiatric illness (Phase 2 data only). Of these over 60% were psychiatric in nature compared to only 9% being chronic medical conditions (Table 120); 30% were noted to have formal documentation of chronic substance abuse disorder. Interestingly, these figures correspond to those for Illicit Drug Users generally and for benzodiazepine users, but contrast with those for patients testing positive for alcohol and opioids (approximately 50% past psychiatric illness); THC users appear to have an incidence of psychiatric illness midway between the two (54%). The high proportion of psychiatric illness in patients presenting intoxicated as a result of drugs of abuse was highlighted in the examination of the whole data set (Tables 12 & 13). There was no difference between methamphetamine, amphetamine or MDMA in this regard.

Table 120: Incidence of past history of psychiatric, drug abuse/dependency, and chronic medical illness in amphetamine-positive enrolled patients.

Recorded Past Medical/Psychiatric Illness	Number of Patients
Psychiatric Illness	80
Drug abuse or dependency	37
Other Significant Medical	11
Total number of recorded entries*	128

(*Patients may have had more than one medical or psychiatric condition. Data was not recorded for all patients enrolled)

Presenting Complaint:
The primary clinical reason for attending the ED was recorded in 193 patients (Table 121). The large majority were classified as having presented due to psycho-social issues related to drug misuse. These presentations included formal psychiatric illness, situational crises, and behavioural issues such as violence or threatening behaviour requiring police intervention and medical assessment.

Violence and trauma was a feature of the presentations of patients intoxicated with amphetamines. In addition to the cases of violent behaviour included in the ‘psycho-social’ classification, 21 patients (11%) presented as a result of multiple trauma of sufficient severity to warrant specialist Trauma Team assessment, and 9 patients (5%) were the victims of trauma to an isolated body area; 12 patients attended as a result of involvement in a motor vehicle accident. Contrary to a popular perception amongst some users of MDMA being a “love

drug", there was little difference between the individual amphetamines in terms of association with violence and trauma.

Table 121: Major presenting complaint clinical system of patients testing positive to an amphetamine.

System of Presenting Complaint	Number of Patients (%)
Psycho-social	90 (47)
Poisoning	23 (12)
Multi-trauma	21 (11)
Neurological	20 (10)
Cardiovascular	13 (7)
Single trauma	9 (5)
Gastrointestinal	3 (1)
Other	14 (7)
Total	193

(Multi-trauma = trauma severity requiring trauma team assessment, single trauma = trauma severity not requiring trauma team assessment)

Triage Category:
A total of 134 patients (54%) were assigned a triage category of 1 or 2, indicating a severity of illness on arrival to hospital requiring immediate or urgent (within 10 minutes) medical assessment. There was no difference between the individual drugs.

Table 122: Number of amphetamine-positive patients assigned to each triage category.

Triage Category	Number of Patients
1	40 (16)
2	94 (38)
3	92 (37)
4	18 (7)
5	3 (1)
Total	247

Clinical Vital Signs:
Data on recorded clinical vital signs for amphetamines as a group is shown in Tables 123 and 124. An abnormal heart rate (rate > 100 (tachycardia) or < 60 (bradycardia) bpm) was the most frequently detected abnormal clinical vital sign; 18 patients (7%) had rates likely to be clinically significant (rate > 150 or < 60 bpm). Tachycardia was most likely to be seen in patients testing positive to amphetamines.

Only 3 patients were hypotensive (blood pressure < 90) and likely to have been in a shocked state. One patient had a blood pressure of greater than 200; sustained blood pressure of this level potentially places the patient at risk of neurological (eg stroke) or cardiac (eg infarction) adverse events.

Signs suggestive of profound depression of respiratory function were seen in 4 patients with a respiratory rate < 10 and 1 patient with blood oxygen saturation of less than 90%. These are more typically signs of opiate, alcohol, or benzodiazepine abuse, and when evident in patients abusing psycho-stimulants may represent profound toxicity in conjunction with depression of conscious state.

Seven patients had hyperthermia (temperature > 37.5ºC) and 14 hypothermia (temperature < 35ºC).

Tables 123 and 124: Clinical vital signs measures in amphetamine users.

Pulse Rate	No. Patients
Not recorded	6
<60	13
60-100 (NR)	125
101-150	98
>150	5

RR	No. Patients
Not recorded	18
<10	4
10 to 20 (NR)	177
21-30	43
>30	5

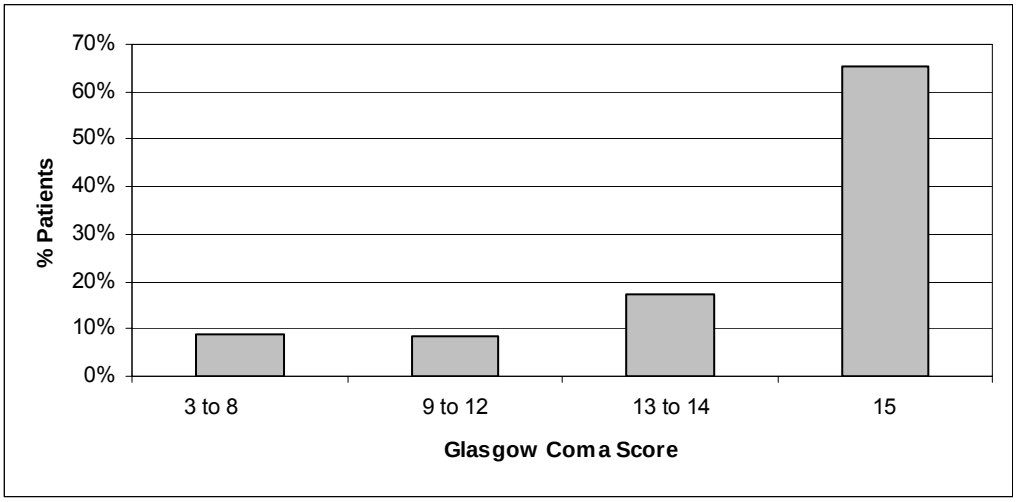
Systolic BP	No. Patients
Not recorded	15
<90	3
90-150 (NR)	196
150-200	32
>200	1

Oxygen Saturation	No. Patients
Not recorded	100
<85	0
85-90	1
91-95	22
96-100 (NR)	124

(BP = blood pressure, NR = normal range, RR = respiratory rate)

The GCS allocated to patients testing positive to an amphetamine are depicted in Figure 29. Of the 247 patients 8 (3%) had a GCS of 3 reflecting the deepest level of unconsciousness, and 22 (9%) were classified in the range 3 to 8 (‘severely’ depressed conscious state, generally requiring urgent management of the patients’ airway).

Figure 31: Conscious levels of patients as measured by the Glasgow Coma Score (GCS): 3 to 8 (severe), 9 to 12 (moderate), 13 to 14 (mild), 15 (normal).



Disposition from the ED:
Approximately 38% of amphetamine users were admitted to hospital (Table 125), which is somewhat less than for Illicit Drug Users as a whole (43% admission rate). Intensive care or high dependency admission was required in 21 patients (9%) including 2 patients requiring monitoring by the cardiologists. Ultimately, approximately 85% of patients had been discharged from hospital by the time of completion of data entry (generally within 2 weeks of enrolment) which equates to the discharge rate for Illicit Drug Users. One patient died, 7 remained in in-patient psychiatric facilities, and 2 were in long-term rehabilitation.

Tables 125 and 126: Place to which patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total (%)
Discharged	154 (62)
Admitted	
EECU	41 (17)
General Ward	21 (8)
ICU/HDU	19 (8)
Cardiology	2 (<1)
Psych. Ward	2 (<1)
Transferred	5 (2)
Unknown	2 (<1)

Disposition from Hospital	Total (%)
Home	211 (85)
Absconded	18 (7)
Psych services	9 (4)
SAPOL custody	2 (1)
Rehabilitation	2 (1)
Died	1
Other hospital	
Other/Unknown	4 (2)

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit, Psych = Psychiatry, SAPOL = South Australian Police)

Fatalities:
There was 1 fatal case thought likely to be directly attributable to illicit intravenous injection of methamphetamine. The case is discussed in Section 3.1. “Overview and Combined Results: Fatalities”.

Summary:

Enrolments:

- Of the 1134 enrolled patients returning positive drug tests, a total of 247 patients (22%) tested positive to a psycho-stimulant.

Demographics:

- Over 92% of patients were Caucasian. Although amphetamines were detected in 6 of the 51 Indigenous patients (12%), this represented only 2% of all patients testing positive to these drugs.

- The average age of patients testing positive for amphetamines was 27.8 years
- 6% of psycho-stimulant positive patients were less than 18 years of age
- Patients testing positive to MDMA were on average more than 2 years younger than those testing positive to methamphetamine and 3 years younger than amphetamine-positive patients
- Male to female ratio of psycho-stimulant positive patients was 3:2 other than for those under 18 years of age where it reversed
- The most likely time of presentation was between midnight and 6am Sunday
- 61% presented between 6pm Friday and 6am Monday
- Over 50% of psycho-stimulant exposures occurred in a private residence and 33% occurred in a licensed premises
- 22% of MDMA exposures occurred in a private residence and 62% in a licensed venue.

Patterns of Drug Use:

- Rates of psycho-stimulant detection were much greater than pre-study predictions (22% compared to predicted 5%) which likely represents a marked increase in use over this time
- A total of 341 drug tests positive for amphetamines were returned in the 247 patients at an average of 1.38 amphetamines per patient
- Proportional rates of detection were similar in Illicit Drug Users and victims of Drink Spiking
- Methamphetamine was the most frequently detected amphetamine (53%) followed by MDMA (28%) and amphetamine (15%)
- Much of the amphetamine detected may be as a result of metabolism of methamphetamine

- Small numbers of MDEA positive results were returned and were most likely additives/contaminants to MDMA tablets. MDA was most likely present as a metabolite of MDMA
- There were 304 tests positive to drugs other than amphetamines in this group of which 26% were benzodiazepines, 25% alcohol, 21% THC, 9% opioids, and 5% antipsychotics or antidepressants
- Some of the highest blood levels of MDMA and methamphetamine were detected in victims of Drink Spiking
- 32% of patients testing positive to a psycho-stimulant were IDU
- 9% of patients were Hepatitis C positive.

3.3.3 Benzodiazepines

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

Of the 1134 enrolled patients returning positive drug tests, a total of 397 patients (35%) tested positive to benzodiazepines. This compares with our pre-study estimated detection rate of 25%. The number of patients testing positive was second only to alcohol with 670 patients (Table 6). A total of 900 tests positive for a benzodiazepine were returned, the most of any drug group. After excluding positive tests likely to be due to the metabolites of parent compounds (see “Patterns of Drug Use” below), there were 608 positive benzodiazepine tests.

Demographic Details:
Ethnicity:
The distribution of benzodiazepine-positive patients across the ethnic groups is shown in Table 127. Just over 90% of patients were Caucasian. Benzodiazepines were detected in 24 Indigenous patients, representing only 6% of all patients testing positive to these drugs. However, this represented a detection rate of 47% amongst the Indigenous patient group (24 of the 51 patients), the highest other than for alcohol (Table 105). There appeared to be little difference in selection of the various benzodiazepines between the ethnic groups.

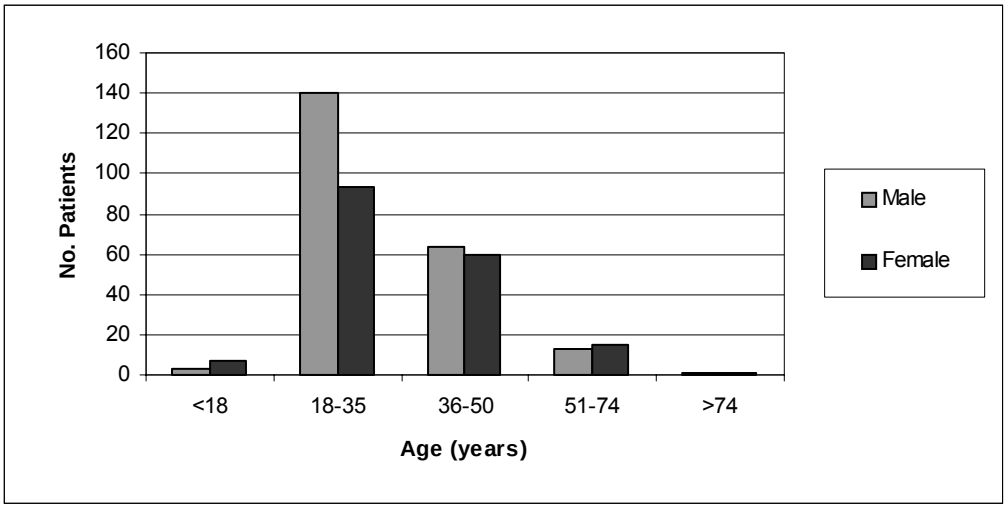
Table 127: Ethnicity of patients testing positive to benzodiazepines.

Ethnicity	Total (%)
Caucasian	358 (90)
Indigenous	24 (6)
Asian	3 (1)
African	1
Other	11 (3)
Total	397

Age and Gender:
Ten patients testing positive to a benzodiazepine were under 18 years of age (2.5% of all benzodiazepine-positive patients). The average age of patients was 34.2 years. This was less than that for opioids (35.6 years) but was older than that for all other drug types. Male users of benzodiazepines were on average, just over 1½ years younger than females (33.5 years compared to 35.1 years respectively).

As with drug positive enrolments generally, more males returned benzodiazepine-positive tests than females. However, this male predominance was much less pronounced than with other drug types with an overall ratio of approximately 5 males to 4 females. Once again this ratio reversed for those under 18 years of age.

Figure 32: Age and gender distribution of patients testing positive to benzodiazepines.



There was some variation in gender and age ratios between the specific benzodiazepines. Of those testing positive to temazepam, 6% were under 18 years of age compared to 2% of diazepam/ nordiazepam users (and 3% overall). Additionally, the male to female ratio was reversed in patients testing positive temazepam and was evenly divided in those testing positive to oxazepam.

Time of Presentation:
The most likely time of presentation to the ED was between 6 pm and midnight on a Thursday (Table 128). The proportion presenting between 6 pm Friday and 6 am Monday (58 of 240 patients in Phase 2, (24%)) was less than that seen with other drug types and for Illicit Drug Users as a whole (48%, Table 27). There was a much more even distribution of benzodiazepine-positive patient presentations across the week although the large majority still presented 'out of hours' (145 of 240 patients (60%) between 1800 and 0600).

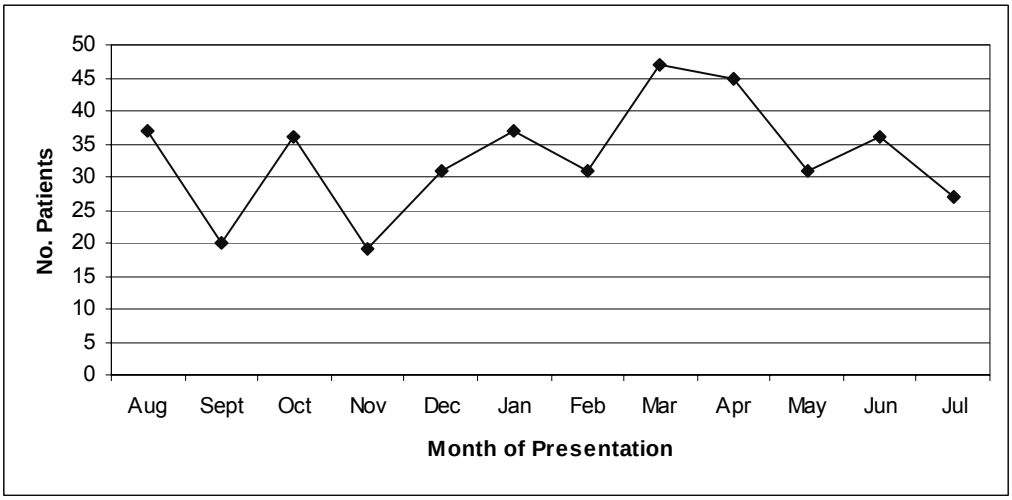
Table 128: Day and time of presentation to the ED of patients testing positive to benzodiazepines.

Time	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Total (%)
0001-0559	14	8	7	6	10	9	9	63 (26)
0600- 1159	6	4	8	7	1	7	5	38 (16)
1200-1759	5	16	6	4	9	10	7	57 (24)
1800-2400	11	6	14	8	20	15	8	82 (34)
Total (%)	36 (15)	34 (14)	35 (15)	25 (10)	40 (17)	41 (17)	29 (12)	240

(Phase 2 data only, *n=240*)

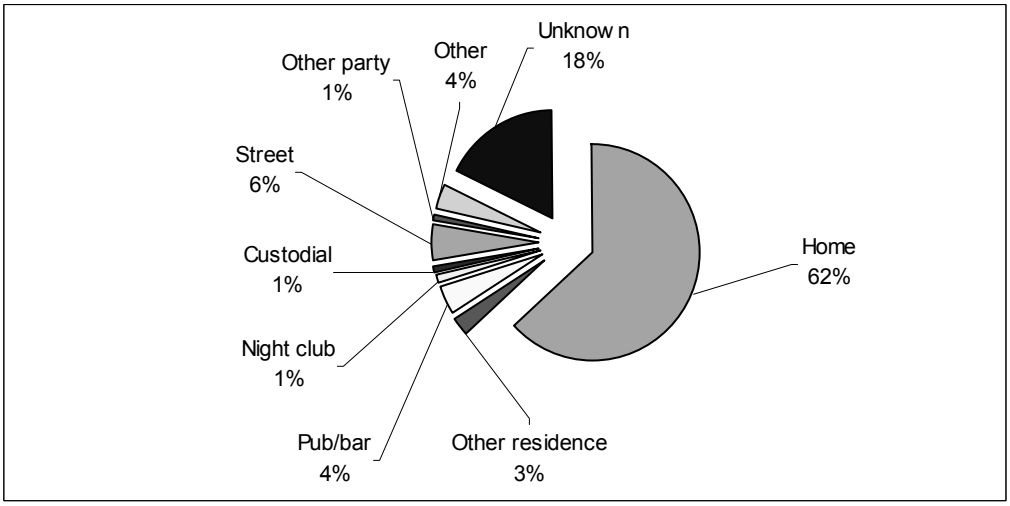
There was perhaps more variation in monthly enrolments of patients testing positive to benzodiazepines (Figure 31) than with enrolments generally. There also appears to be a trend to increased benzodiazepines-related presentations between March and June, somewhat later than that seen with alcohol or amphetamine-related presentations.

Figure 33: Number of patients testing positive to a benzodiazepine enrolled per month.



Venue of exposure and mode of transport to ED:
The venue of benzodiazepine exposure was recorded in all 397 patients and is shown in Figure 32. Over 60% of exposures occurred in a private residence, usually the patient's home; only 5% of exposures occurred in a licensed premises, the smallest proportion of any of the major drug groups other than opioids.

Figure 34: Venue of drug exposure for patients testing positive to a benzodiazepine.



Mode of transport to the ED was mostly via ambulance services (Table 129). This is broadly consistent with mode of arrival patterns seen in other study enrolment categories, and matches most closely the Self-Harm group of patients.

Table 129: Mode of arrival to the ED for patients testing positive to benzodiazepines.

Mode of Arrival	Number of Patients (%)
Ambulance	177 (74)
Police/Custodial	17 (7)
Private car	27 (11)
Walked in	8 (3)
Taxi	4 (2)
Unknown/Other	7 (3)
Total	240

(Phase 2 data only, *n=240*)

Patterns of Drug Use:

Benzodiazepines were detected in 397 patients, the second highest number of drug-positive patients (35% of drug-positive enrolments) after alcohol (Table 6). This rate of detection is slightly higher than our pre-commencement estimate of 25% of enrolments based on data from the review by the Hazardous Substances Section of the Environmental Health Service of South Australia on poisoning cases assessed at the RAH 2002[10] (see "Methods: Outcome Measures").

It had been expected that most benzodiazepine-positive patients would present to the ED intoxicated or poisoned in association with Self-Harming behaviour given the close association between the prescription of these drugs and mood related disorders. Surprisingly, half of the patients testing positive for benzodiazepines presented as a result of Illicit Drug Use, possibly highlighting a problem with diversion of these prescription drugs for this use (Table 130). None-the-less, the proportion of patients presenting as a result of Self-Harm was greater in the benzodiazepine-positive group of patients than for any other drug type.

Table 130: Number of patients testing positive to a benzodiazepine enrolled in each presentation category.

Presentation Category	Number of Patients (%)
Illicit Drug Use	198 (50)
Self-Harm	164 (41)
Suspected/Unknown	18 (5)
Accidental Poisoning	8 (2)
Drink Spiking	7 (2)
Iatrogenic	2
Total	397

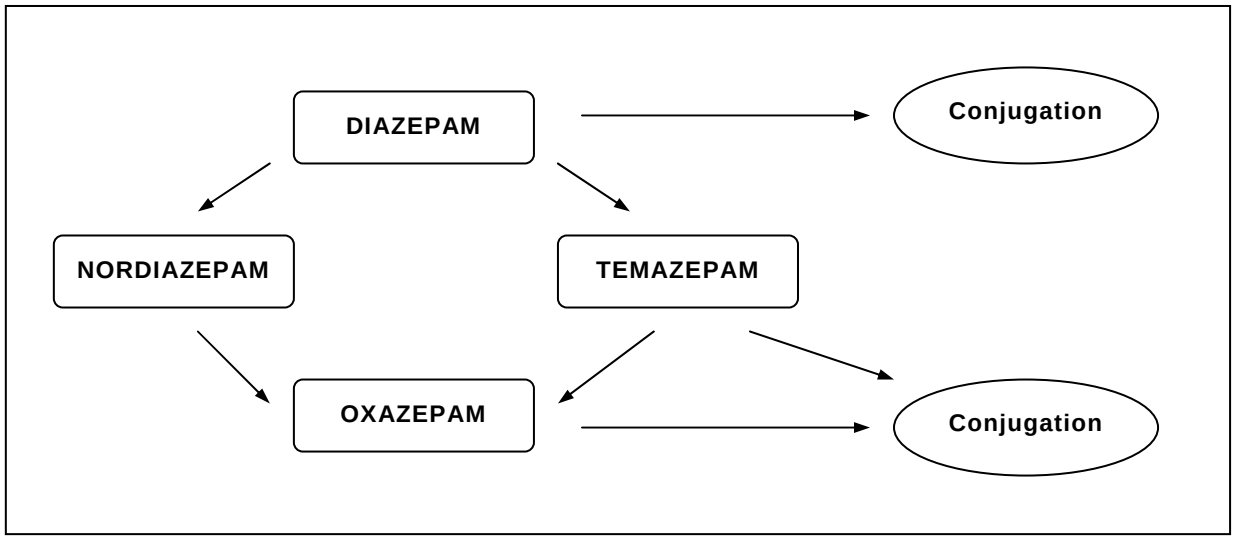
Benzodiazepines, which are widely held to be common agents used for Drink Spiking, were only detected in 9% of enrolled victims of Drink Spiking (Table 61). Not only was this type of drug infrequently seen in these patients, but the actual benzodiazepines detected were unexpected; in all but one of the cases the drug detected was diazepam or its principle metabolite nordiazepam. This contrasts with perceptions that the shorter-acting benzodiazepines such as flunitrazepam (Rohypnol) are typically employed for Drink Spiking. Benzodiazepines were detected in isolation or with alcohol alone, on only 2 occasions, being found most commonly in conjunction with amphetamines (50%, Table 65b).

As has been previously discussed, it is likely that the majority of patients in the Unknown/Suspected presentation group were the result of Illicit Drug Use. (See Section 3.2.4. “Unknown and Suspected Drug Use”).

A total of 900 benzodiazepine-positive tests were returned from the 397 patients. Of these, however, there were 321 samples testing positive to nordiazepam which is a long acting by-product of the metabolism of diazepam (292 positive samples) and is not available as a proprietary formulation. As nearly all samples testing positive for diazepam also tested positive to nordiazepam, we have assumed that all cases of diazepam ingestion will have been included in the nordiazepam figures and, unless stated otherwise, excluded them from our calculations.

To further complicate matters, some marketed compounds may be products of metabolism of other marketed compounds (e.g. oxazepam is marketed as Murelax and may also be a product of both diazepam and temazepam metabolism). It is not possible for us to determine the number of blood samples testing positive for oxazepam that were due to ingestion of diazepam or temazepam only as against co-ingestion. As oxazepam is a frequently prescribed benzodiazepine we have made the assumption that all tests positive to oxazepam were due to ingestion of oxazepam rather than being present as a result of metabolism of another benzodiazepine parent compound. This will result in an overestimation of both the total number of benzodiazepine exposures and the number of oxazepam exposures. (See Figure 35)

Figure 35: Metabolism of Diazepam.



Poly-substance abuse:
With the factors relating to metabolism discussed above taken into account, we have estimated the total number of benzodiazepine exposures to be approximately 608 in the 397 patients. This equates to approximately 1.5 different benzodiazepine exposures per patient. If we exclude all cases of oxazepam (82 samples) as possibly being the result of metabolism of a different parent compound, the average number of different benzodiazepine exposures per patient prior to presentation would still be 1.3. As an example of the abuse by patients of

multiple drugs within the class, although nordiazepam was the sole benzodiazepine detected in 190 patients, it was detected with one or more other benzodiazepines in 120 cases (63%).

Table 131: Number of positive tests for individual benzodiazepines in each presentation category.

Drug Name	Presentation Category				Total (%)
	Self-Harm	Illicit Drug Use	Drink Spiking	Other	
Nordiazepam*	125	168	7	21	321 (53)
Temazepam	54	24		6	84 (14)
Oxazepam	43	35	1	3	82 14)
Alprazolam	31	44		7	82 (14)
Clonazepam	3	14		1	18 (3)
Nitrazepam	7	4		1	12 (2)
Lorazepam	4	1		0	5 (1)
Bromazepam	1	1		0	2
Triazolam	1			0	1
Flunitrazepam	1			0	1
Total	270	291	8	39	608

(*major metabolite of diazepam)

In addition to the benzodiazepines, the 397 patients also returned a total of 574 tests positive for other drugs (Table 132). Approximately 44% of these patients tested positive to alcohol, 25% to THC, 23% to an opiate, and 20% to an amphetamine. The proportion of results positive for ecstasy (MDMA) and related drugs such as GHB, ketamine, cocaine and LSD was less than that seen in patients in the other drug groups. Just over 18% of patients testing positive for a benzodiazepine also tested positive to an antidepressant, however only 3% returned positive tests for an antipsychotic drug.

The relatively low detection rates of ecstasy and related drugs, and high detection rates of antidepressants in this group of patients likely reflects the higher incidence of patients presenting due to Self-Harm rather than Illicit Drug Use. Additionally, because of an older average age (other than for opioids) patients testing positive for benzodiazepines might be argued to be more likely to suffer physical and mental illness, in part explaining some of these drug use patterns. This latter though would seem marginal given the small differences in average ages.

Table 132: Incidence of other drugs detected in patients testing positive for benzodiazepines.

Drugs Detected	Number of Positive Tests
Alcohol	175
THC	101
Amphetamine group	79
Amphetamine	16
Methamphetamine	48
MDMA	13
Pseudoephedrine	2
Opioids	90
Methadone	33
Morphine	8
Heroin	1
Oxycontin	1
Codeine	47
GHB	5
Cocaine	4
Ketamine	1
Antipsychotics	12
Antidepressants	73
Other Medical	38
Total	574

Drug levels:

There was some variation in the average blood levels for the benzodiazepines between the enrolment groups (Table 133). Generally the higher levels were seen in patients using drugs in association with Self-Harm, which contrasts with most other drug-positive groups. In addition to the surprisingly low incidence of benzodiazepine detection in victims of Drink Spiking, the blood levels were also comparatively quite low. The highest recorded blood level of a benzodiazepine in a victim of Drink Spiking was 0.31 mg/L of nordiazepam which, although within the therapeutic range, is well below the toxic range. This case did, however, have toxic levels of an amphetamine.

Table 133: Average blood drug levels for some of the major benzodiazepines for each presentation category.

	Presentation Category			
Drug	Self-Harm	Illicit Drug Use	Drink Spiking	Unknown
Nordiazepam*	0.31	0.28	0.11	0.24
Clonazepam	0.20	0.10		0.01
Oxazepam	0.29	0.24	0.02	0.03
Alprazolam	0.20	0.12		0.14

(Concentrations in mg/L)(*major metabolite of diazepam)

Table 134: Highest detected blood drug levels of the benzodiazepines with therapeutic and toxic ranges.

Drug Name	Blood Level	Therapeutic Range	Toxic Range
Diazepam	3.2	0.12 – 0.5	> 1.5 (L > 5)
Nordiazepam*	2.2	0.2 – 0.8	1.5 – 2
Temazepam	7	0.3 – 0.9	> 2 (L > 8)
Clonazepam	0.4	0.02 – 0.07	> 0.1
Oxazepam	3.0	0.5 – 2	> 2 (L > 3 – 5)
Alprazolam	0.83	0.005 – 0.05	0.1 – 0.4

(Concentrations all in mg/L. L = lethal levels. All ranges referenced from The International Association of Forensic Toxicologists, internet listing of Therapeutic and Toxic Drug Levels.)) (*major metabolite of diazepam)

Drug Habit:

The history of drug use reported by patients testing positive to benzodiazepines is shown in Table 135. The proportional representation of the major drugs shown in this table is similar to those for the various enrolment categories generally (Tables 34, 51, 80) as well as across the various drugs of abuse.

Table 135: Frequency of drug use reported by patients testing positive to benzodiazepines.

	Frequency of Use							
Reported Drug Use	Never	Daily	Week	Month	Year	Not specified*	Past use only	Total Responses
Alcohol		149	43	9	2	26	2	231
Cigarettes		153	3	1	1	3		161
Benzodiazepines		87	7	2	2	15		113
Cannabis		68	13	15	3	14	2	115
Amphetamines		24	28	13	5	27	1	98
Methamphetamine		7	12	5	4	18		46
MDMA (ecstasy)		1	7	2	4	10	2	26
Heroin		13	8	3	3	22	9	58
GHB/Fantasy			2	1		1	1	5
Cocaine			1		4	9	1	15
Ketamine						2		2
LSD/Acid			1		2	8	1	12
Mushrooms					3	4		7
Nitrous/Bulbs					1	2		3
Amyl/Rush					1	1		2

(*Stated drug used but frequency of use not recorded) (data not recorded for all patients)

Data on drug use was obtained from 306 of the 397 patients (77%) in the group with a total of 903 responses giving an average of 2.95 drugs used per patient in the group. Cigarettes, alcohol and cannabis were the most commonly reported drugs used and their reported use was

typically daily. Similarly, the reported frequency of use of benzodiazepines was also most commonly given as daily. By contrast, use of amphetamines, ecstasy and related drugs tended to be weekly. This pattern was also evident among Illicit Drug Users generally, as well as in the Self-Harm group.

The incidence of injecting drug abuse previously documented in case records of patients testing positive for a benzodiazepine was surprisingly high (32% of patients, Table 136), which was the same as that seen in patients testing positive for an amphetamine. Of these almost 50% were hepatitis C positive. In contrast, only 5% were hepatitis B positive. The IDRS shows substantial benzodiazepine use among IDU, with greater than 50% having used recently[16].

Table 136: Number of patients with previously documented injecting drug use and transmissible viral disease, among patients testing positive for benzodiazepines.

Behaviour	Number of Patients
IV Drug Use	128 (32)
Hepatitis B positive	7 (2)
Hepatitis C positive	62 (16)
HIV positive	4 (1)

Clinical Correlates:
Relevant data on the clinical correlates for patients testing positive for benzodiazepines has also been reviewed in “Clinical Correlates” of Section 3.1.

Medical History:
There were 540 data entries specific to chronic medical or psychiatric illness (Phase 2 data only). Of these over 60% were psychiatric in nature compared to only 6% being chronic medical conditions (Table 137); 34% were noted to have documented chronic substance abuse. As previously noted, these figures correspond to those for Illicit Drug Users generally and for amphetamine users, but contrast with those for patients testing positive for alcohol and opioids (approximately 50% past psychiatric illness).

Table 137: Incidence of past history of psychiatric, drug abuse/dependency, and chronic medical illness in benzodiazepine-positive enrolled patients.

Recorded Past Medical/Psychiatric Illness	Number of Patients
Psychiatric Illness	323
Drug abuse or dependency	184
Other Significant Medical	31
Total number of recorded entries*	540*

(*Patients may have had more than one medical or psychiatric condition. Phase 2 data only. Data was not recorded for all patients enrolled)

Nordiazepam (major metabolite of diazepam), temazepam, and oxazepam were detected at proportionally similar rates across patients with a past history of psychiatric, medical illness or drug abuse, whereas clonazepam, alprazolam and nitrazepam were not generally detected in patients with chronic medical illness.

Presenting Complaint:
The primary clinical reason for attending the ED was recorded in 240 patients (Phase 2 only, Table 138). The large majority were classified as having presented due to psycho-social issues related to drug misuse. These presentations included formal psychiatric illness, situational crises, and behavioural issues such as violence or threatening behaviour requiring police intervention and medical assessment.

Violence and trauma was less of a feature than that seen with patients presenting intoxicated with amphetamines or alcohol (Table 98, Table 121). None-the-less, 13% of presentations were related specifically to trauma.

Table 138: Major presenting complaint clinical system of patients testing positive to a benzodiazepine.

System of Presenting Complaint	Number of Patients (%)
Psycho-social	124 (52)
Poisoning	30 (12)
Multi-trauma	17 (7)
Neurological	20 (8)
Cardiovascular	16 (7)
Single trauma	14 (6)
Gastrointestinal	9 (4)
Other	10
Total	240

(Multi-trauma = trauma severity requiring trauma team assessment, single trauma = trauma severity not requiring trauma team assessment. Phase 2 data only, *n=240*)

Triage Category:
A total of 198 patients (50%) were assigned a triage category of 1 or 2, indicating a severity of illness on arrival to hospital requiring immediate or urgent (within 10 minutes) medical assessment. This was similar to that seen with the other drug groups except for GHB and LSD, both of which had a much higher average acuity level at the time of presentation. There was no difference between the individual benzodiazepines in this regard.

Table 139: Number of patients testing positive to benzodiazepines assigned to each triage category on arrival to the ED, according to presentation category.

Presentation Category	Triage Priority				
	1	2	3	4	5
Self-Harm	23	63	74	4	
Illicit Drug Use	32	59	82	22	3
Drink Spiking	1	1	4		1
Suspected/Unknown	3	11	1	2	1
Other	2	3	3	2	
Total (%)	61 (15)	137 (35)	164 (41)	30 (8)	5 (1)

Clinical Vital Signs:
Data on recorded clinical vital signs for benzodiazepines as a group is shown in Tables 140 and 141. An abnormal heart rate (rate > 100 (tachycardia) or < 60 (bradycardia) bpm) was the most frequently detected abnormal clinical vital sign; 19 patients (5%) had rates likely to be clinically significant (rate > 150 or < 60 bpm).

A fall in systolic blood pressure is a recognised complication of benzodiazepine toxicity, and 9 patients were hypotensive (blood pressure < 90) and likely to have been in a shocked state. One patient had a blood pressure of greater than 200 which is not associated with benzodiazepine use, and almost certainly represents effects of concomitant use of a psycho-stimulant.

Signs suggestive of profound depression of respiratory function, also expected in benzodiazepine toxicity, were seen in 15 patients with a respiratory rate < 10 and 9 patients with blood oxygen saturation (SaO2) of less than 90%; 2 patients were severely hypoxic with SaO2 less than 85%.

Eight patients had hyperthermia (temperature > 37.5ºC) and 14 hypothermia (temperature < 35ºC) (Phase 2 data only).

Tables 140 and 141: Clinical vital signs measures in patients testing positive for benzodiazepines.

Pulse Rate	No. Patients
Not recorded	17
<60	18
60-100 (NR)	264
101-150	97
>150	1

RR	No. Patients
Not recorded	40
<10	15
10 to 20 (NR)	300
21-30	41
>30	1

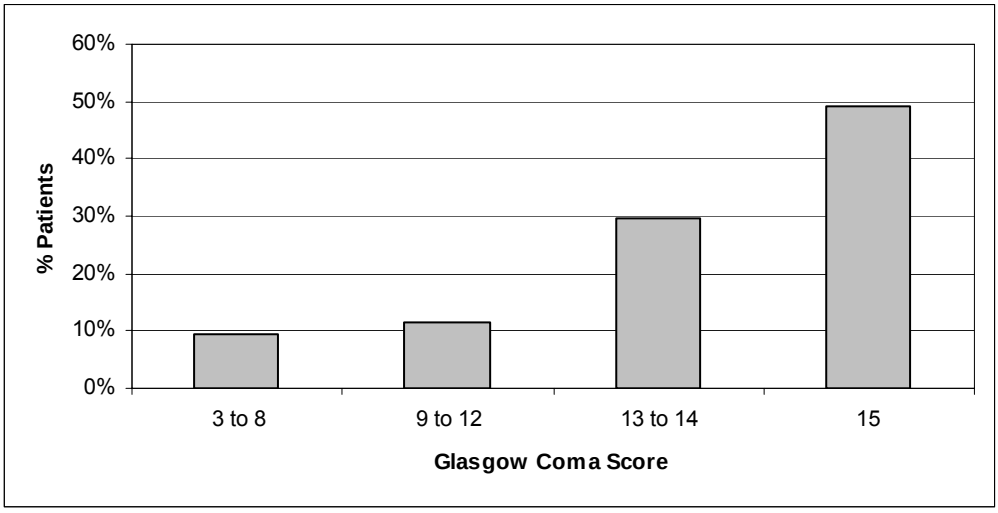
Systolic BP	No. Patients
Not recorded	26
<90	9
90-150 (NR)	340
150-200	21
>200	1

Oxygen Saturation	No. Patients
Not recorded	143
<85	2
85-90	7
91-95	46
96-100 (NR)	199

(BP = blood pressure, NR = normal range, RR = respiratory rate)

The GCS allocated to patients testing positive to a benzodiazepine are depicted in Figure 33. Of the 397 patients 9 (2%) had a GCS of 3 reflecting the deepest level of unconsciousness, and 38 (10%) were classified in the range 3 to 8 ('severely' depressed conscious state, generally requiring urgent management of the patients' airway).

Figure 36: Conscious levels of patients as measured by the Glasgow Coma Score (GCS): 3 to 8 (severe depression of conscious state), 9 to 12 (moderate depression), 13 to 14 (mild depression), 15 (normal).



Despite the protective effect of benzodiazepines against seizures 10 patients (2.5%) testing positive for these drugs were recorded as having seizure activity during the period of intoxication (Table 142). Of these, 8 patients had tonic-clonic seizures, 3 of whom suffered multiple seizures. In all cases, the patients tested positive to other drugs known to cause seizures when taken in overdose.

Table 142: Number of patients testing positive to benzodiazepines who suffered seizures during the period of intoxication.

Seizure Activity	Number of Patients (%)
Unknown	41 (10)
Nil	346 (87)
Myoclonus	2 (<1)
Single Grand Mal	5 (1)
Multiple Grand Mal	3 (<1)
Total	397

Disposition from the ED:

Approximately 63% of patients testing positive to benzodiazepines were admitted to hospital (Table 143), reflective of the relatively high proportion of patients in this group presenting as a result of intentional Self-Harm (see Tables 56 and 40). Intensive care or high dependency admission was required in 50 patients including 1 patient requiring monitoring by the cardiologists. Ultimately, approximately 80% of patients had been discharged home from hospital by the time of completion of data entry (generally within 2 weeks of enrolment). One patient died (see details page 31), 33 remained in in-patient psychiatric facilities, and 1 was in long-term rehabilitation.

Tables 143 and 144: Place to which patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total (%)
Discharged	144 (37)
Admitted	
EECU	138 (35)
General Ward	43 (11)
ICU/HDU	49 (12)
Cardiology	1
Psych. Ward	1
Transferred	15 (4)
Unknown	3 (1)

Disposition from Hospital	Total (%)
Home	319 (80)
Absconded	30 (8)
Psych services	33 (8)
SAPOL custody	8 (2)
Rehabilitation	1
Died	1
Other hospital	
Other/Unknown	5 (1)

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit, Psych = Psychiatry, SAPOL = South Australian Police)

Fatalities:

Although one enrolled patient who tested positive to a benzodiazepine died during the study period the cause of death was due to cerebral anoxia following hanging (see Table 25). Although the death was not directly attributable to benzodiazepine overdose it could be argued

that the temazepam that was taken, in conjunction with THC, may well have played a role in the emotional and cognitive state of the patient immediately prior to her decision to commit suicide.

The fact that there were no deaths directly attributable to benzodiazepine toxicity is somewhat surprising given the fact that the highest recorded levels of each of the benzodiazepines were well above the cited potential fatal threshold (Table 134). In each of these cases at least one other drug was also found in clinically significant levels (Table 145), and in all cases these additional drugs were sedatives or have sedating effects in overdose. Despite this, the vital signs of these patients were within normal ranges other than for the patient recording the highest clonazepam level who had a severely depressed conscious state with a Glasgow Coma Score of 8. This would suggest a degree of habituation to these drugs by these patients. All bar one of these cases presented as a result of deliberate Self-Harm, the exception being the case with the highest nordiazepam level where drug use intention was not determined.

The case recording the highest level of clonazepam did require emergency medical resuscitation, was intubated and admitted to intensive care, but was eventually discharged to home following psychiatric assessment.

Table 145: Quantitative results of blood drug testing of patients returning the highest benzodiazepine levels.

Highest Level Benzodiazepine	Positive Toxicology	Blood Drug Level (mg/L)
Alprazolam	Alcohol	0.02
	Sertraline	0.1
	Alprazolam	0.83
Diazepam	Alcohol	0.02
	Diazepam	3.2
	Temazepam	3.5
	Nordiazepam*	0.44
	Oxazepam	0.05
	Nitrazepam	0.59
	Amino-nitrazepam	0.06
Oxazepam	Diazepam	0.05
	Nordiazepam*	0.04
	Oxazepam	3.0
Nordiazepam*	Diazepam	1.5
	Codeine	0.03
	Nordiazepam*	2.2
	THC	2
Clonazepam	Methadone	0.2
	Amitryptiline	0.5
	Olanzapine	0.6
	Clonazepam	0.4
	Alprazolam	0.06
Temazepam	Alcohol	0.19
	Diazepam	0.31
	Temazepam	7
	Nordiazepam*	0.44

(*major metabolite of nordiazepam)

Summary:

Enrolments:

- Of the 1134 enrolled patients returning positive drug tests, a total of 397 patients (35%) tested positive to benzodiazepines
- The number of patients testing positive was second only to alcohol with 670 patients.

Demographics:

- 90% were Caucasian
- Benzodiazepines were detected in 24 Indigenous patients representing a detection rate of 47% of all drug positive Indigenous patients
- The average age of benzodiazepine-positive cases was 35.6 years
- 2.5% were under 18 years of age
- The male to female patient ratio was less than other groups at 5 to 4
- The most likely time of presentation was between 6pm and midnight on a Thursday
- 24% presented between 6pm Friday and 6am Monday, the least of any group
- Over 60% of drug exposures occurred in a private residence with only 5% in a licensed premises.

Patterns of Drug Use:

- The majority of patients (50%) presented as a result of Illicit Drug Use rather than Self-Harm (41%)
- A total of 900 benzodiazepine-positive tests were returned from the 397 patients of which up to 608 are thought to represent separate doses
- There were 574 tests positive to drugs other than benzodiazepines: 44% alcohol, 25% THC, 23% opioids, 20% psycho-stimulants
- 128 patients (32%) had documented past IDU, 50% of these were hepatitis C positive
- Generally, higher drug levels were seen in patients using drugs in association with Self-Harm.

3.3.4 Cannabis

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

Of the 1134 enrolled patients returning positive drug tests, a total of 259 patients (23%) tested positive to THC which approximates our pre-study estimated detection rate of 25%. The number of patients testing positive was second only to alcohol with 670 patients and benzodiazepines with 397 patients (Table 6).

The large majority of THC-positive patients (71%) were in the Illicit Drug Use enrolment group with only 15% presenting as a result of intentional Self-Harm (Table 146). Higher proportional Illicit Drug Use was seen only with GHB (84% Illicit Drug Use) and amphetamines (77% Illicit Drug Use).

Table 146: Number of THC-positive patients in each presentation category.

Presentation Category	Number of Patients (%)
Illicit Drug Use	184 (71)
Self-Harm	39 (15)
Drink Spiking	7 (3)
Unknown/Suspected	26 (10)
Other	3 (1)
Total	259

Demographic Details:
Ethnicity:
The distribution of THC-positive patients across the ethnic groups is shown in Table 147. Just over 86% of patients were Caucasian. THC was detected in 23 Indigenous patients, representing only 9% of all patients testing positive to this drug. However, this represented a detection rate of 45% amongst the Indigenous patient group (23 of the 51 patients), the third highest after alcohol (35 patients, 69%) and benzodiazepines (24 patients, 47%, Table 105).

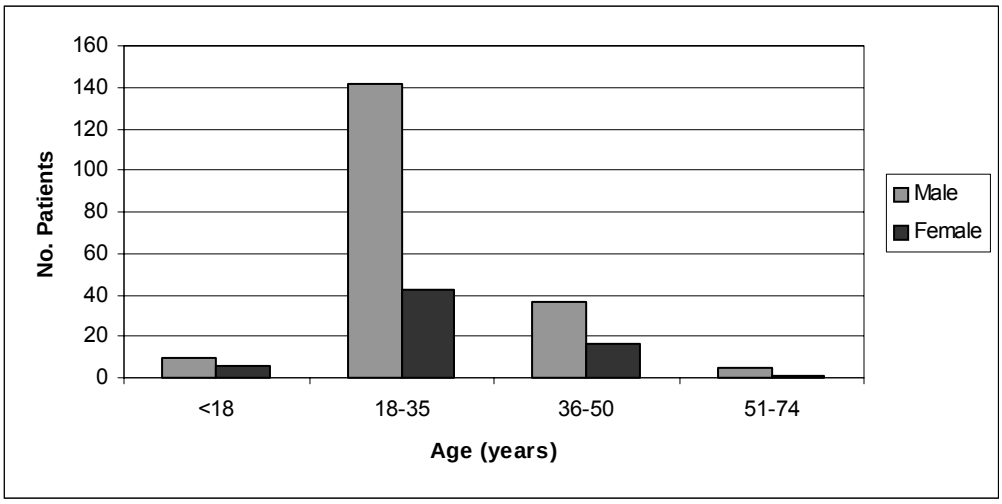
Table 147: Ethnicity of patients testing positive to THC.

Ethnicity	Total (%)
Caucasian	223 (86)
Indigenous	23 (9)
Asian	3 (1)
African	1 (<1)
Other	7 (3)
Total	259

Age and Gender:
Sixteen patients testing positive to THC were under 18 years of age (6% of all THC-positive patients). The average age of patients was 29.8 years; less than that for opioids (35.6 years), benzodiazepines (34.2 years) and alcohol (31.4 years) but older than that for all other drug types. There was no difference between the average ages for the genders.

As with drug positive enrolments generally, more males returned THC-positive tests than females (3 male to 1 female). This male predominance persisted across all age ranges unlike most other drug types (GHB was the exception) where this ratio reversed for those under 18 years of age.

Figure 37: Age and gender distribution of patients testing positive to THC.



Time of Presentation:

The most likely time of presentation to the ED was between 6 pm and midnight on a Thursday or between 1 am and 6 am Saturday (Table 148). However, there was little difference between the presentation rates for Thursday through Monday evenings. The proportion presenting between 6 pm Friday and 6 am Monday (63 of 144 patients in Phase 2, 44%) approximated that seen for Illicit Drug Users as a whole (48%, Table 27).

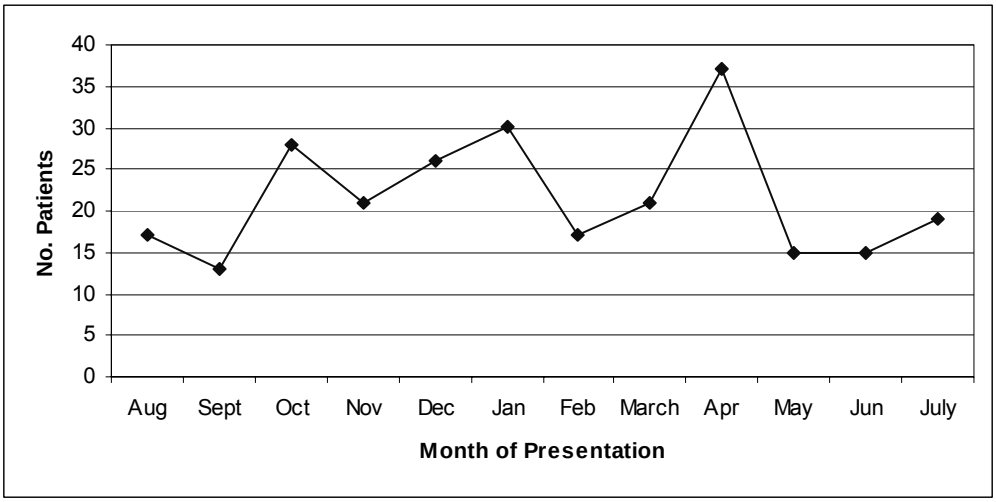
Table 148: Day and time of presentation to the ED of patients testing positive to THC.

Time	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Total (%)
0001-0559	8	2	3	3	2	3	10	31 (22)
0600-1159	4	2	2	4	3	1	2	18 (13)
1200-1759	7	8	4	2	4	4	6	35 (24)
1800-2400	7	7	6	3	10	9	8	50 (35)
Total	26 (18)	19 (14)	15 (11)	12 (8)	19 (13)	17 (12)	26 (18)	134

(Phase 2 data only, *n=134*)

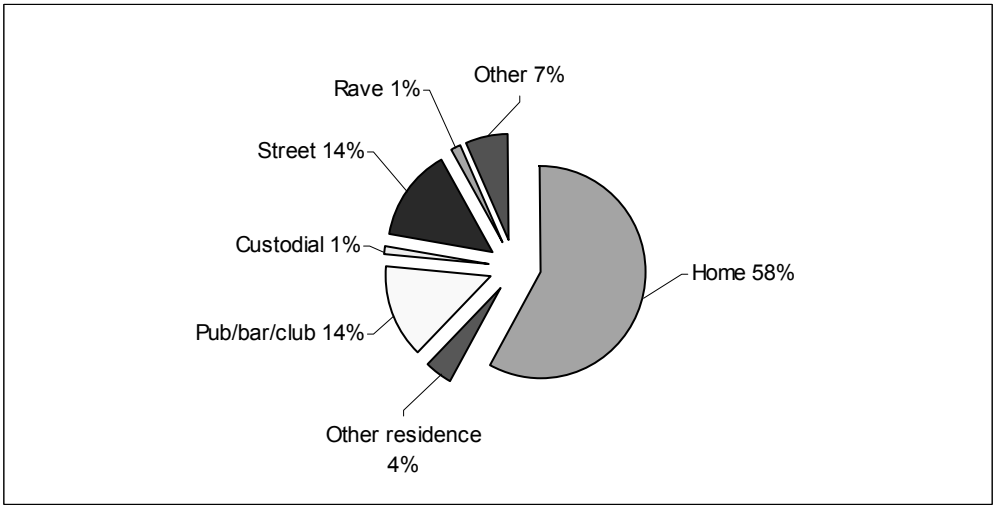
The pattern of monthly enrolments of patients testing positive to THC showed a general rise in numbers over the summer months, peaking in December and April but with a prominent dip during February and March (Figure 35). The overall pattern was similar to that for alcohol (Figure 22) and amphetamines (Figure 27), but contrasted with benzodiazepine monthly presentation rates (Figure 31). The cause of the fall in presentation rates seen during February and March is uncertain.

Figure 38: Number of patients testing positive to THC enrolled per month.



Venue of exposure and mode of transport to ED:
The venue of THC exposure was recorded in 147 (57%) patients and is shown in Figure 36. Over 60% of exposures occurred in a private residence, usually the patient's home. Only 14% of exposures occurred in a licensed premises, whilst the same proportion used the drug 'on the street'. These figures contrast with those for both alcohol and amphetamines with approximately 30% of exposures in licensed premises (Figures 23 & 28), and with benzodiazepines with only 5% (Figure 32).

Figure 39: Venue of drug exposure for patients testing positive to THC (n = 147).



(data not recorded for all patients)

Mode of transport to the ED was mostly via ambulance services (Table 149). This is broadly consistent with mode of arrival patterns seen in other study enrolment categories other than perhaps victims of Drink Spiking.

Table 149: Mode of arrival to the ED for patients testing positive to THC.

Mode of Arrival	Number of Patients (%)
Ambulance	89(67)
Police/Custodial	14 (10)
Private car	19 (14)
Walked in	8 (6)
Unknown/Other	4 (3)
Total	134

(Phase 2 data only, *n=134*)

Patterns of Drug Use:

Analysis of patients' blood in this study was for the parent compound THC, rather than for its longer lasting metabolite THC acid. Measurement of the former is more indicative of acute use and intoxication, whilst the latter may indicate use up to a week prior to testing.

Just over 70% of patients testing positive to THC presented to the ED as a result of Illicit Drug Use (Table146) and THC was detected in 27% (184 of 687) of all enrolled Illicit Drug Users. By comparison, the frequency of THC detection in the Self-Harm group was 16% and was 8% in victims of Drink Spiking.

In 1 of the 3 THC-positive cases enrolled in the accidental poisoning group, it is likely the THC exposure was unintended (patient consumed a biscuit with THC added). In the other 2 cases and in the cases of Drink Spiking it is more difficult to explain unintended THC exposure.

Poly-substance abuse:

As can be seen from Table 150, THC was not uncommonly detected in isolation (12%) in enrolled patients (and therefore, by definition, determined to be clinically intoxicated or drug affected). This is contrary to the popular perception that THC, in isolation, rarely leads to intoxication or toxicity sufficient to indicate ED attendance, that it is the co-ingestants that cause the significant symptomatology. Additionally, it is possible that patients with a psychosis precipitated or aggravated by THC may not have been enrolled into the study as they did not fit the classic mould of "intoxication", thereby lessening the apparent adverse effects of THC in these results.

Table 150: Number of occasions THC was detected alone or with other drugs.

Number of Drugs	Number of Patients
THC only	32 (12)
THC + 1 other	113 (44)
THC + 2 others	79 (30)
THC + 3 others	28 (11)
THC + >3 others	7 (3)

Table 151: Incidence of other drugs detected in patients testing positive for THC.

Drugs Detected	Number of Positive Tests
Benzodiazepine	160
Alcohol	117
Amphetamine group	103
Amphetamine	64
Methamphetamine	60
MDMA	17
Pseudoephedrine	1
MDEA	1
MDA	1
Opioids	52
Codeine	17
Methadone	18
Morphine	17
Tramadol	2
GHB	3
Ketamine	2
Antipsychotic/Antidepressant	21

Poly-substance abuse was clearly frequent in those testing positive to THC. In addition to the THC tests, a total of 472 positive drug tests[o] were returned on the 259 patients. This equates to an average of 1.83 positive drug tests (including THC) per patient; 14% of patients tested positive to 3 or more drugs additional to the THC (Table 150). The most commonly detected drugs are shown in Table 151. The relative representation of the major drug groups follows a similar pattern to that seen among Illicit Drug Users other than for a reversal of benzodiazepines and alcohol (Table 29). This latter was a feature of the Self-Harm presentation group (Table 46).

Drug levels:
There was some variation in the average blood levels for THC between the enrolment groups (Table 152). Generally the higher levels were seen in the Illicit Drug Use patients and in the Suspected category, which is in keeping with other drug-positive groups apart from the benzodiazepines.

[o] *Excludes diazepam and amphetamine – see discussions "Poly-substance Abuse", Section II "Amphetamines" and "Benzodiazepines".*

Table 152: Average blood THC levels for each presentation category (µg/L).

Presentation Category	THC Level
All Patients	3.69
Illicit Drug Use	3.82
Self-Harm	2.86
Drink Spiking	2.71
Accidental Poisoning	2.67
Suspected	4.60

The highest recorded blood level of THC was 25 µg/L in a patient who deliberately ingested cannabis mixed in butter (see "Clinical Correlates" below).

Drug Habit:
The history of drug use reported by patients testing positive to THC is shown in Table 153. The proportional representation of the major drugs shown in this table is similar to those for the various enrolment categories generally (Tables 34, 51, 80) as well as across most of the drugs of abuse.

Table 153: Frequency of drug use reported by patients testing positive to THC.

	Frequency of Use						
Reported Drug Use	Daily	Week	Month	Year	Not specified*	Past use only	Total Responses
Alcohol	45	21	6		14		86
Cigarettes	69	1			1		71
Benzodiazepines	18	2			4		24
Cannabis	40	16	8		9	1	74
Amphetamines	13	19	4	2	13		51
Methamphetamine	2	5	5	1	8		21
MDMA (ecstasy)	1	3	5		4		13
Heroin	5	3	2		3	5	18
GHB/Fantasy					1		1
Cocaine		1			2		3
Ketamine					2		2
LSD/Acid		2			2	1	5
Mushrooms					1		1
Nitrous/Bulbs					2		2
Amyl/Rush					1		1

(*Stated drug used but frequency of use not recorded) (data not recorded for all patients)

The incidence of injecting drug abuse previously documented in case records of patients testing positive for THC was lower than both amphetamine and benzodiazepine-positive

patients (17% of patients, Table 154). Of these almost 50% were hepatitis C positive whilst only 3 patients were hepatitis B positive.

Table 154: Number of patients with previously documented injecting drug use and transmissible viral disease, among patients testing positive for THC.

Behaviour	Number of Patients
IV Drug Use	47 (18)
Hepatitis B positive	3 (1)
Hepatitis C positive	22 (8)
HIV positive	1 (<1)

Clinical Correlates:
Relevant data on the clinical correlates for patients testing positive for THC has also been reviewed in "Clinical Correlates" of Section 3.1.

Medical History:
There were 232 data entries specific to chronic medical or psychiatric illness (Phase 2 data only). Of these over 50% were psychiatric in nature compared to only 9% being chronic medical conditions (Table 155); 37% were noted to have documented chronic substance abuse.

Table 155: Incidence of past history of psychiatric, drug abuse/dependency, and chronic medical illness in THC-positive enrolled patients.

Recorded Past Medical/Psychiatric Illness	Number of Patients
Psychiatric Illness	126
Drug abuse or dependency	85
Other Significant Medical	21
Total number of recorded entries*	232*

(*Patients may have had more than one medical or psychiatric condition. Phase 2 data only. Data was not recorded for all patients enrolled)

Presenting Complaint:
The primary clinical reason for attending the ED was recorded in 139 patients (Phase 2 only, Table 156). Broadly speaking, there were 4 main types of presentation complaints: unspecified 'overdose' or drug 'misuse' (31 patients); altered conscious state (23 patients); altered mental state, with or without behavioural abnormalities (34 patients); and, as a result of trauma or violence (32 patients). Thirteen patients (9%) presented as a result of being involved in motor vehicle accidents, 11 of whom met criteria for specialist trauma team assessment. The presentations related to altered mental state included formal psychiatric illness, situational crises, and behavioural issues such as violence or threatening behaviour requiring police intervention and medical assessment.

Table 156: Major presenting complaint clinical system of patients testing positive to THC.

System of Presenting Complaint	Number of Patients (%)
Poisoning	32 (23)
Psycho-social	29 (21)
Neurological	22 (16)
Single trauma	19 (14)
Multi-trauma	13 (9)
Cardiovascular	10 (7)
Gastrointestinal	6 (4)
Other	4 (3)
Total	139

(Multi-trauma = trauma severity requiring trauma team assessment, single trauma = trauma severity not requiring trauma team assessment. Phase 2 data only)

Triage Category:

A total of 146 patients (54%) were assigned a triage category of 1 or 2, indicating a severity of illness on arrival to hospital requiring immediate or urgent (within 10 minutes) medical assessment (Table 157). This was similar to that seen with the other drug groups except for GHB and LSD, both of which had a much higher average acuity level at the time of presentation.

Table 157: Number of patients testing positive to THC assigned to each triage category on arrival to the ED, according to presentation category.

	Triage Priority				
Presentation Category	1	2	3	4	5
Self-Harm	6	17	15	1	
Illicit Drug Use	25	66	62	28	3
Drink Spiking		3	2	2	
Suspected/Unknown	7	14	2	2	1
Other		2		1	
Total (%)	38 (15)	108 (39)	87 (31)	35 (13)	4 (2)

Clinical Vital Signs:

Data on recorded clinical vital signs for THC as a group is shown in Tables 158 and 159. An abnormal heart rate (rate > 100 (tachycardia) or < 60 (bradycardia) bpm) was the most frequently detected abnormal clinical vital sign; 14 patients (5%) had rates likely to be clinically significant (rate > 150 or < 60 bpm), most of whom had a bradycardia. This was unexpected as, typically in overdose, THC would be expected to cause a sinus tachycardia. Nine patients were hypotensive (blood pressure < 90).

Tables 158 and 159: Clinical vital signs measures in patients testing positive for cannabis.

Pulse Rate	No. Patients
Not recorded	6
<60	12
60-100 (NR)	175
101-150	64
>150	2

RR	No. Patients
Not recorded	15
<10	7
10 to 20 (NR)	204
21-30	33
>30	0

Systolic BP	No. Patients
Not recorded	12
<90	9
90-150 (NR)	217
150-200	21
>200	0

Oxygen Saturation	No. Patients
Not recorded	53
<85	3
85-90	1
91-95	27
96-100 (NR)	175

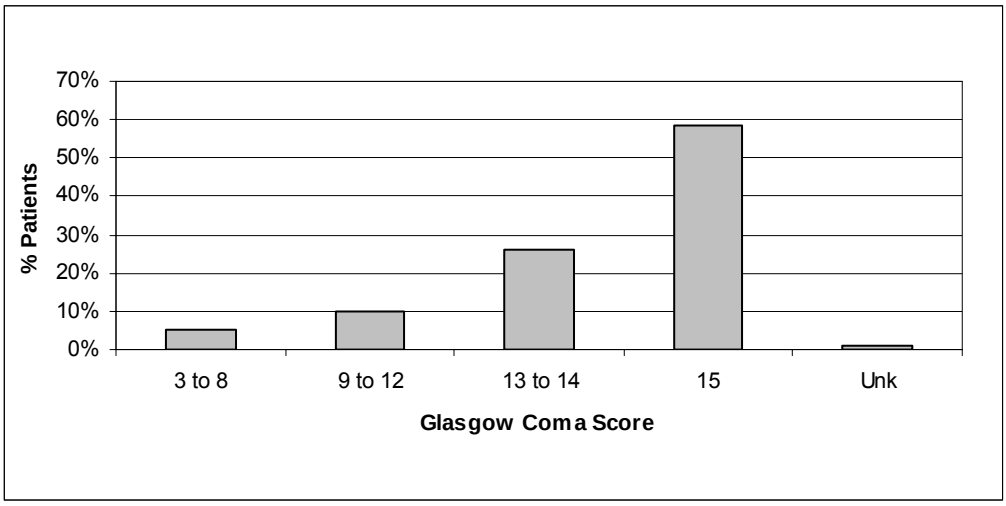
(BP = blood pressure, NR = normal range, RR = respiratory rate)

Signs suggestive of profound depression of respiratory function were seen in 7 patients with a respiratory rate < 10 and 4 patients with blood oxygen saturation (SaO2) of less than 90%; 3 patients were severely hypoxic with SaO2 less than 85%. Again, these are clinical findings not normally expected with THC overdose.

The highest recorded blood level of THC was 25 µg/L in a patient who had deliberately ingesting cannabis mixed in butter. This patient, aged in his 50's, had a severely depressed conscious state on arrival at the ED with a GCS of 7. He was also noted to have a significant bradycardia of 46 bpm and was hypotensive (blood pressure of 88/49 mmHg); his respiratory rate and oxygen saturations were normal. This patient also tested positive to very high levels of nor-diazepam and diazepam (0.35 mg/L and 0.36 mg/L respectively).

The GCS allocated to patients testing positive to THC are depicted in Figure 37. Of the 259 patients 5 (2%) had a GCS of 3 reflecting the deepest level of unconsciousness, and 14 (5%) were classified in the range 3 to 8 ('severely' depressed conscious state, generally requiring urgent management of the patients' airway).

Figure 40: Conscious levels of patients as measured by the Glasgow Coma Score (GCS): 3 to 8 (severe depression of conscious state), 9 to 12 (moderate depression), 13 to 14 (mild depression), 15 (normal).



(Unk = unknown)

Disposition from the ED:

Approximately 53% of patients testing positive to THC were admitted to hospital (Table 160). Intensive care or high dependency admission was required in 16 patients. Ultimately, 83% of patients had been discharged home from hospital by the time of completion of data entry (generally within 2 weeks of enrolment). Four of the patients who died tested positive to THC (1.5% of all positive for THC), 11 remained in in-patient psychiatric facilities, and 2 were in long-term rehabilitation.

Tables 160 and 161: Place to which patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total (%)
Discharged	122(47)
Admitted	
EECU	74 (29)
General Ward	34 (13)
ICU/HDU	16 (6)
Burns	1 (<1)
Psych. Ward	4 (1)
Transferred	7 (3)
Unknown	1 (<1)

Disposition from Hospital	Total (%)
Home	214 (83)
Absconded	22 (9)
Psych services	11 (4)
SAPOL custody	5 (2)
Rehabilitation	2 (1)
Died	4 (2)
Other hospital	1 (<1)
Other/Unknown	0

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit, Psych = Psychiatry, SAPOL = South Australian Police)

Fatalities:
Of the 6 enrolled patients who died during the study period, 4 tested positive to THC (67% of all drug positive deaths); 3 in combination with another drug, one to THC alone (Table 162). Of the 6 deaths 3 were aged less than 18 years; all 3 of these patients ultimately died as a result of hanging and all 3 tested positive to THC.

Table 162: Details of enrolled patients who died and tested positive to THC. (Extract from Table 25).

Case	Gender	Age	Nature of Drug Use	Venue	Drug	Level
1	male	< 18	Self-Harm	Home	THC	3µg/L
2	female	51 – 74	Illicit Drug Use	Unknown	THC	3µg/L
					Methamphetamine	0.35mg/L
3	female	< 18	Self-Harm	Unknown	THC	20µg/L
					Ketamine	2
4	female	< 18	Self-Harm	Home	THC	5µg/L
					Temazepam	0.1

The level of methamphetamine found in case 2 in Table 162 was above the potentially fatal threshold and was likely the direct cause of death (see Section 3.1. “Overview & Combined Results: Fatalities”). The THC level in most cases was ‘moderate’ however, and even in the case where the THC level was a very high 20 µg/L, it is unlikely that the drug was directly causative. The link between death of a teenager from suicide and the presence of high levels of THC in the blood may well be clinically noteworthy. This association does not prove causation but it could be hypothesized that the use of THC by patients suffering depression or suicidal ideation, in this age group, may lower cognitive barriers to completion of the act. The alternative, that young patients most likely to complete violent suicide are more likely, for other reasons, to use THC is also possible.

Summary:

Enrolments:

- Of the 1134 enrolled patients returning positive drug tests, a total of 259 patients (23%) tested positive to THC
- The number of patients testing positive was second only to alcohol with 670 patients and benzodiazepines with 397 patients.

Demographics:

- 86% of patients were Caucasian
- THC was detected in 23 Indigenous patients, representing a detection rate of 45% amongst the Indigenous patient group (23 of the 51 patients), the third highest after alcohol (35 patients, 69%) and benzodiazepines (24 patients, 47)
- The average age of patients testing positive to cannabis was 29.8 years
- Sixteen patients testing positive to THC were under 18 years of age (6% of all THC-positive patients)

- The male to female ratio was 3 to 1
- Time of presentation was fairly evenly spread across the week and time of day compared to other drug types
- Over 60% of drug exposures were at a private residence; 14% were in a licensed venue.

Patterns of Drug Use:

- Rates of THC detection (23%) approximated our pre-study estimated detection rate of 25%
- 70% presented as a result of Illicit Drug Use, 15% Self-Harm, 3% Drink Spiking
- 12% tested positive to THC alone
- In addition to the THC tests, a total of 631 positive drug tests were returned on the 259 patients equating to an average of 3.3 positive drug tests (including THC) per patient
- 14% of patients tested positive to 3 or more drugs additional to the THC
- The highest average THC blood levels were among Illicit Drug Users
- 47 patients (18%) were IDU; 22 were Hepatitis C positive
- High rates of a past history of psychiatric illness (126 specific conditions) were reported
- 4 of the 6 deaths in the study, and 3 of the 4 suicides, tested positive to THC.

3.3.5 Opioids

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

Of the 1134 enrolled patients returning positive drug tests, a total of 149 (13%) tested positive to opioids. This compares with our pre-study estimated detection rate of 10%. Opioids were the fifth most common type of drugs detected after alcohol, benzodiazepines, THC and amphetamines (Table 6).

Demographic Details:
Ethnicity:
The overwhelming majority of patients were Caucasian (95%) with the next largest ethnic group, Indigenous patients, representing just 4% of all patients testing positive to these drugs (Table 163). Of all Indigenous patients enrolled into the study, however, the proportion testing positive to an opioid (6 of 51, 12%) was similar to the rates of opioid detection overall (13%).

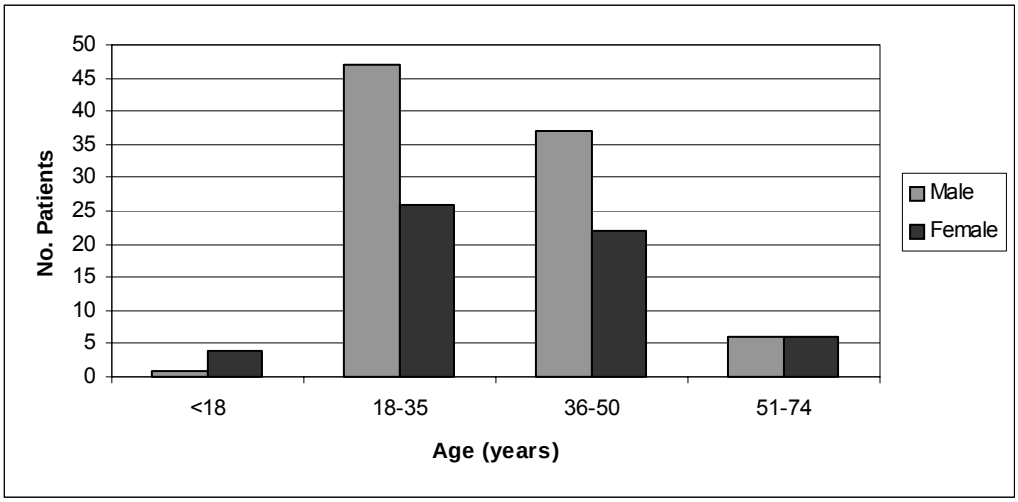
Table 163: Ethnicity of patients testing positive to opioids.

Ethnicity	Total (%)
Caucasian	141 (95)
Indigenous	6 (4)
Other	2 (1)
Total	149

Age and Gender:
Five patients testing positive to an opioid were under 18 years of age (3% of all opioid-positive patients), a similar rate to that seen with benzodiazepines, but half that of amphetamines, alcohol and THC. All 5 tested positive to codeine. The average age of patients was 35.6 years which was older than that for all other drug types. There was little difference overall between the genders with respect to average ages or for individual drugs within the class other than for codeine, where males were on average 4 years older (37.8 compared to 33.7 years).

As with drug positive enrolments generally, more males returned opioid-positive tests than females. Once again this ratio reversed for those under 18 years of age, whilst there was no difference in those over 50 years of age (Figure 38).

Figure 41: Age and gender distribution of patients testing positive to opioids.



Time of Presentation:
There was a fairly even distribution of opioid-positive patient presentations across the week (Table 164). Similarly, no real pattern with respect to the time-of-day of presentations could be determined apart from a trend to present in the afternoon or evening. Although this is in keeping with presentations to the ED generally, it contrasts with all the other major drug groups studied, which showed a greater likelihood to present on the weekends and between 6 pm and 6 am.

Table 164: Day and time of presentation to the ED of patients testing positive to opioids.

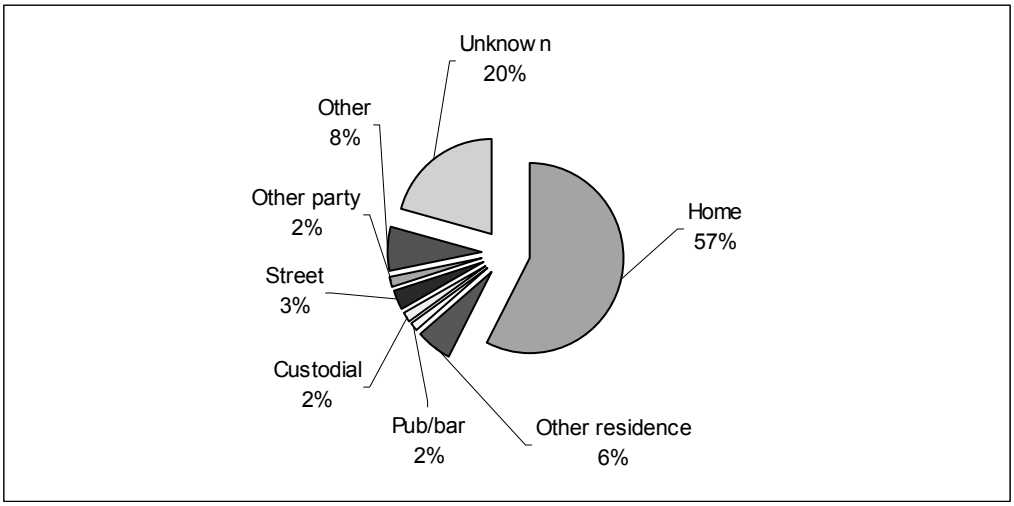
Time	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Total (%)
0001-0559	3	2	1	3		3	1	13 (16)
0600-1159	4		3	2		5	2	16 (19)
1200-1759	3	6	4	2	4	8	5	32 (39)
1800-2400	4	3	1	3	7	2	2	22 (26)
Total (%)	14 (17)	11 (13)	9 (11)	10 (12)	11 (13)	18 (22)	10 (12)	83

(Phase 2 data only, *n = 83*)

Although there was a large variation in monthly enrolments of patients testing positive to opioids the numbers were small and the differences therefore not significant.

Venue of exposure and mode of transport to ED:
The venue of opiate exposure was recorded in 120 of the 149 patients (8%) and is shown in Figure 39. Over 60% of exposures occurred in a private residence, usually the patient's home; only 2% of exposures occurred in a licensed premises, the smallest proportion of any of the major drug groups. This pattern was similar to that seen with benzodiazepine-positive patients but contrasts with the other major drug types.

Figure 42: Venue of drug exposure for patients testing positive to an opioid.



Mode of transport to the ED was mostly via ambulance services (Table 165).

Table 165: Mode of arrival to the ED for patients testing positive to an opioid.

Mode of Arrival	Number of Patients (%)
Ambulance	60 (72)
Police/Custodial	6 (7)
Private car	10 (12)
Walked in	4 (5)
Unknown/Other	3 (4)
Total	83

(Phase 2 data only, *n=83*)

Patterns of Drug Use:

As noted, opioids were detected in 149 patients, the majority presenting as a result of Illicit Drug Use (56%). The relatively large number of patients presenting as a result of Self-Harm (36%, Table 166) is largely due to the high rates of codeine in this group, often taken in conjunction with paracetamol (38 of 65 positive opiate drug tests in this group, Table 167). No victims of Drink Spiking tested positive to an opioid.

Table 166: Number of opioid-positive patients in each presentation category.

Presentation Category	Number of Patients (%)
Illicit Drug Use	83 (56)
Self-Harm	54 (36)
Suspected/Unknown	6 (4)
Accidental Poisoning	5 (3)
Drink Spiking	0
Iatrogenic	1 (1)
Total	149

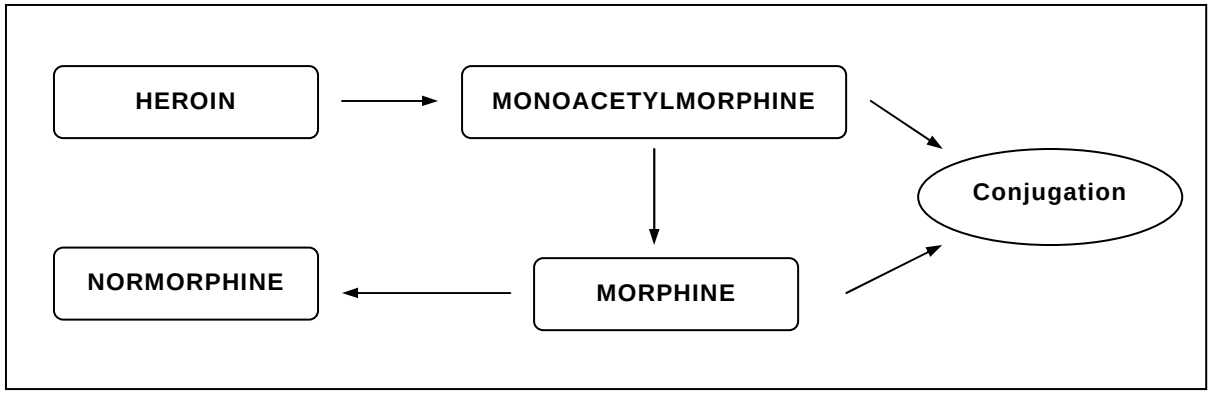
Table 167: Frequency of positive blood results for opioids according to presentation category.

Drug Name	Presentation Category			Total (%)
	Self-Harm	Illicit Drug Use	Other	
Codeine	38	36	6	80 (42)
Morphine	15	39	2	56 (30)
Methadone	8	29	5	42 (22)
Heroin		4		4 (2)
Oxycontin	1		1	2 (1)
Dextropropxyphene	3	2		5 (2)
Total (%)	65 (34)	110 (58)	14 (8)	189

The significance of the high number of cases testing positive for codeine (42% of positive opioid tests, 54% of opioid-positive patients) is uncertain as, although the drug is felt to be commonly abused[p], it is also freely available and widely used for therapeutic reasons. Of the 80 patients positive for codeine, 33 had levels above the therapeutic range (0.01 to 0.05 mg/L)[30], perhaps suggesting it was taken by them for other than therapeutic reasons. Of these, only 6 were enrolled as Illicit Drug Users whilst 21 as deliberate Self-Harm. This might suggest that, although not uncommonly abused, it was not commonly abused in this study population.

The surprisingly low rates of heroin detection in this study have been previously noted (Section 3.1. “Overview and Combined Results”, and Section 3.2.1. “Illicit Drug Use”). Heroin is metabolised to 6-monoacetylmorphine (MAM) and then to morphine. However, because of the rapid metabolism of both heroin and its major metabolite, MAM, (half lives of approximately 5 and 15 minutes respectively), intravenous heroin use more than ½ to 1 hour prior to blood sampling in the ED may result in tests positive only to morphine[23]. (See Figure 43)

Figure 43: Metabolism of Heroin (Diacetylmorphine).



Evidence for this might be seen in Table 168. This shows that all but 13 of the cases suspected by the clinician to be heroin, morphine or methadone related intoxications (either reported by the patient or persons accompanying, or from ambulance reports) tested positive for one of these drugs. This suggests overall reasonable accuracy of clinician suspicion of the use of these drugs. However, there was a discrepancy in the rates of reporting of the individual parent compounds being abused compared to their rates of detection; heroin use appears

[p] *Personal communication SAPOL, Chemical Diversion Desk.*

much over-reported, and morphine and methadone, under-reported compared to the blood test results. It is probable that most cases recorded as being due to heroin use were accurately reported but the heroin had been metabolised to morphine by the time of blood sampling. Alternative explanations, that morphine and/or methadone is commonly sold as heroin, or that the users are frequently confusing them seems unlikely, given differences in formulation and appearance, and there is no evidence of this being a widespread phenomenon. If we assume that all reported/suspected cases of heroin use were correct (37 cases) this would mean that 37 of the tests positive to morphine were due to heroin exposure, leaving 19 cases of morphine as the parent, abused drug.

Table 168: Comparison of the number of patients testing positive to heroin, morphine or methadone and the number reporting they had taken the drug or otherwise suspected of using the drug by the enrolling doctor.

Drug Name	Number of Positive Tests	Number of Patients Reported/Suspected
Heroin	4	37
Morphine	56	31
Methadone	42	21
Total	102	89

Even if the above assessment of the actual incidence of morphine abuse is used (giving the most conservative estimate), a total of 19 morphine and 42 methadone-positive blood tests were recorded. Of these, only 8 methadone-positive patients were enrolled in the Self-Harm group, and only 24 patients were known to have been prescribed methadone. This may suggests a significant problem with diversion of these restricted, prescription drugs, and is supported by reports that such opioid substances are used by IDU to substitute or supplement their heroin use[16].

Poly-substance abuse:
A total of 189 opioid-positive tests were returned from the 149 patients. This equates to approximately 1.4 different opioid exposures per patient. Thirty seven patients (25%) tested positive to more than 1 opioid (Table 169 and 170).

Table 169: Number of patients testing positive to the various combinations of opioids detected, and the number of positive drug tests returned.

Drug Combination	Number of Patients (%)
Morphine	25 (17)
Codeine	47 (32)
Methadone	36 (24)
Dextropropoxyphene	3 (2)
Oxycontin	1 (1)
Morphine + codeine	24 (16)
Methadone + codeine	3 (2)
Methadone + morphine	2 (1)
Methadone + morphine + codeine	1 (1)
Morphine + oxycontin	1 (1)
Codeine + dextropropoxyphene	2 (1)
Heroin + morphine + codeine	3 (2)
Heroin	1 (1)
Total	149

Table 170: Number of occasions an opioid was detected alone or with other drugs.

Number of Drugs	Number of Patients
Opioid only	14 (9)
Opioid + 1 other	46 (31)
Opioid + 2 others	56 (38)
Opioid + 3 others	27 (18)
Opioid + >3	6 (4)
Total	149

The 149 opioid-positive patients returned a total of 342 positive drug tests (other than opioids, Table 171). Almost two thirds of these were a benzodiazepine, 13% alcohol, and 11% THC. The proportion of results positive for ecstasy (MDMA) and related drugs such as GHB, ketamine and LSD was similar to that seen in the benzodiazepine-positive patient group (Table 132), but was less than that seen in patients in the other drug groups. Just under 12% of patients also tested positive to an antidepressant.

Table 171: Frequency of other drugs detected in patients testing positive for an opioid.

Drugs Detected	Number of Positive Tests (%)
Benzodiazepines	221 (65)
Alcohol	45 (13)
THC	39 (11)
Amphetamine group	
Amphetamine	6 (2)
Methamphetamine	18 (5)
MDMA	2 (<1)
MDA	1 (<1)
GHB	2 (<1)
Antipsychotics	5 (1)
Antidepressants	37 (11)
Other Medical/Non-medical	23 (7)
Total	342

Drug Habit:

The history of drug use reported by patients testing positive to opioids is shown in Table 172. The proportional representation of the major drugs shown in this table is similar to those for the various enrolment categories generally (Tables 34, 51, 80) as well as across the various drugs of abuse. Cigarettes, alcohol and cannabis were the most commonly reported drugs used and their reported use was typically daily. Similarly, the reported frequency of use of benzodiazepines was also most commonly given as daily. By contrast, use of amphetamines and ecstasy and related drugs tended to be occasional.

Table 172: Frequency of drug use reported by patients testing positive to opioids.

Reported Drug Use	Frequency of Use						Total Responses
	Daily	Weekly	Monthly	Yearly	Not specified*	Past use only	
Alcohol	35	22	7		14	2	80
Cigarettes	69		1		3		73
Cannabis	22	5	9	2	8	1	47
Heroin	7	7	3	2	18	6	43
Benzodiazepines	24	3	2		11		40
Amphetamines	5	10	5	3	13		36
Methamphetamine	3	6	1	2	6		18
MDMA (ecstasy)		1	2	2	4	2	11
LSD/Acid		1		1	2	1	5
GHB/Fantasy			1		1	1	3
Cocaine		1		1	1		3
Ketamine				1			1
Mushrooms					1	1	2
Nitrous/Bulbs				1	1		2
Amyl/Rush				1			1

(*Stated drug used but frequency of use not recorded, data not recorded for all patients)

The incidence of injecting drug abuse previously documented in case records of patients testing positive for opioids was approximately 47% of patients (Table 173), which was the highest recorded for any of the drug groups (compares with 32% for patients testing positive for an amphetamine). Of these almost 50% were hepatitis C positive. In contrast, only 4% were hepatitis B positive.

Table 173: Number of patients with previously documented injecting drug use and transmissible viral disease, among patients testing positive for opioids.

Behaviour	Number of Patients (%)
IV Drug Use	70 (47)
Hepatitis B positive	3 (2)
Hepatitis C positive	34 (23)
HIV positive	2 (1)

Clinical Correlates:
Relevant data on the clinical correlates for patients testing positive for opioids has also been reviewed in “Clinical Correlates” of Section 3.1.

Medical History:
There were 174 data entries specific to chronic medical or psychiatric illness (Phase 2 data only). Of these approximately 50%% were psychiatric in nature compared to only 9% being

chronic medical conditions (Table 174); 40% were noted to have documented chronic substance abuse.

Table 174: Incidence of past history of psychiatric, drug abuse/dependency, and chronic medical illness in opioid-positive enrolled patients.

Recorded Past Medical/Psychiatric Illness	Number of Patients
Psychiatric Illness	88
Drug abuse or dependency	69
Other Significant Medical	17
Total number of recorded entries*	174*

(*Patients may have had more than one medical or psychiatric condition. Phase 2 data only)

Presenting Complaint:
The primary clinical reason for attending the ED was recorded in 83 patients (Phase 2 only, Table 175). Psycho-social issues related to drug misuse was the most commonly cited reason for presentation. These presentations included formal psychiatric illness, situational crises, and behavioural issues such as violence or threatening behaviour requiring police intervention and medical assessment.

Violence and trauma was less of a feature than that seen with patients presenting intoxicated with amphetamines or alcohol (Table 98, Table 121). None-the-less, 15% of presentations were related specifically to trauma.

Table 175: Major presenting complaint clinical system of patients testing positive to an opioid.

System of Presenting Complaint	Number of Patients (%)
Psycho-social	39 (47)
Poisoning	13 (16)
Multi-trauma	6 (7)
Neurological	5 (6)
Cardiovascular	5 (6)
Single trauma	7 (8)
Gastrointestinal	1 (1)
Other	7 (9)
Total	83

(Multi-trauma = trauma severity requiring trauma team assessment, single trauma = trauma severity not requiring trauma team assessment. Phase 2 data only, *n=83*)

Triage Category:
A total of 77 patients (52%) were assigned a triage category of 1 or 2, indicating a severity of illness on arrival to hospital requiring immediate or urgent (within 10 minutes) medical assessment (Table 176). This was similar to that seen with the other drug groups except for GHB and LSD, both of which had a much higher average acuity level at the time of presentation.

Table 176: Number of patients testing positive to an opioid assigned to each triage category on arrival to the ED.

Triage Category	Number of Patients
1	30
2	47
3	59
4	13
Total	149

Clinical Vital Signs:
Data on recorded clinical vital signs for opioids as a group is shown in Tables 177 and 178 and, in general, differs little from that of the other major drug types; most patients had normal vital signs, and of those who did not a heart rate outside the normal range (rate > 100 (tachycardia) or < 60 (bradycardia) bpm) was the most frequently detected abnormality.

However, the *sine qua non* of opiate poisoning is a decreased level of consciousness with respiratory depression. Consistent with this, signs suggestive of depression of respiratory function were seen in 11 patients (7.4%) with a respiratory rate < 10. This compares to rates of respiratory depression seen with intoxicated patients testing positive for other drug types ranging from 11% for GHB and 3.8% for benzodiazepines to 0.7% for alcohol.

Tables 177 and 178: Clinical vital signs measures in opioid-positive enrolled patients.

Pulse Rate	No. Patients
Not recorded	5
<60	7
60-100 (NR)	96
101-150	41
>150	

RR	No. Patients
Not recorded	17
<10	11
10 to 20 (NR)	105
21-30	15
>30	1

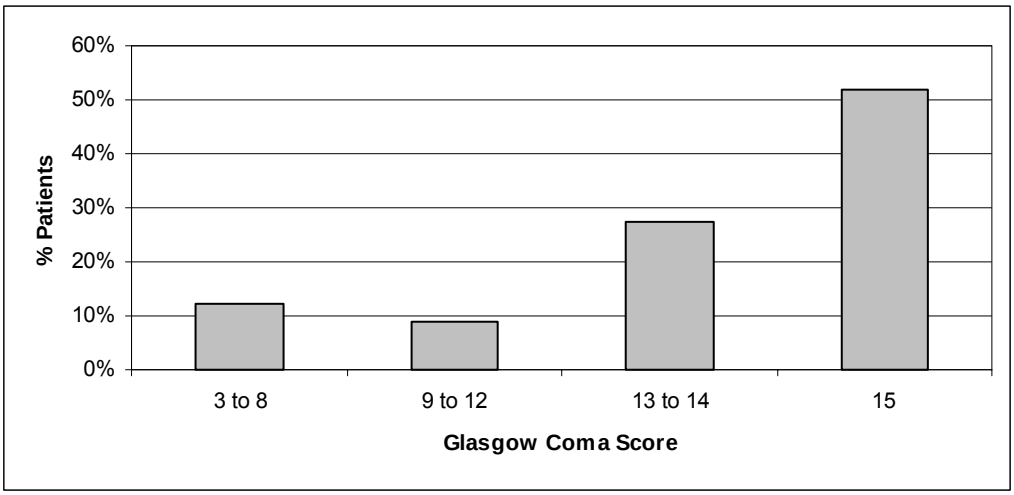
Systolic BP	No. Patients
Not recorded	7
<90	3
90-150 (NR)	122
150-200	17
>200	

Oxygen Saturation	No. Patients
Not recorded	24
<85	
85-90	2
91-95	24
96-100 (NR)	99

(BP = blood pressure, NR = normal range, RR = respiratory rate)

The GCS allocated to patients testing positive to an opiate are depicted in Figure 40. Of the 149 patients 8 (2%) had a GCS of 3 reflecting the deepest level of unconsciousness, and 18 (12%) were classified in the range 3 to 8 ('severely' depressed conscious state). These rates are not too dissimilar to those seen with the majority of drug types other than for GHB (58% with GCS 3 to 8) and THC (5% with GCS 3 to 8).

Figure 44: Conscious levels of patients as measured by the Glasgow Coma Score (GCS): 3 to 8 (severe depression of conscious state), 9 to 12 (moderate depression), 13 to 14 (mild depression), 15 (normal).



Drug levels:
There was some variation in the average blood levels for the opioids between the enrolment groups (Table 179); generally the higher levels were seen in association with Illicit Drug Use. The exception was codeine which was higher in the Self-Harm group, due largely to the number of patients presenting in this group with deliberate overdose of paracetamol-codeine preparations.

Table 179: Comparison of average blood opioid levels for Self-Harm and Illicit Drug Use presentation categories.

	Presentation Category	
Drug Name	**Self-Harm**	**Illicit Drug Use**
Morphine	0.05	0.08
Methadone	0.16	0.24
Codeine	0.13	0.05
Oxycontin	1.00	

(Concentrations in mg/L)

Of the 56 patients testing positive to morphine, none were in the sub-therapeutic range, 6 were in the toxic range and 1 was in the lethal range. This latter was in a Caucasian male aged between 51 and 74 years who had ingested 100mg illicitly and who recorded a blood morphine level of 0.59 mg/L. He had a documented past history of injecting drug abuse. In addition to the morphine, blood analysis was also positive to nordiazepam (0.31 mg/L), diazepam (0.43 mg/L) and clonazepam (0.02 mg/L), blood levels of which were all in the therapeutic ranges. Clinically, he had a slightly decreased GCS (14), pinpoint pupils, and mild respiratory depression. He discharged himself from the ED against advice.

The highest methadone level detected was 1 mg/L, which is also above the lethal threshold. This was in a Caucasian female aged between 18 and 35 years who reported that she had taken an amphetamine only. The patient had a past history of depression and poly-substance

abuse with opiate dependency. Again, the drug was taken illicitly. In addition to the methadone, blood analysis was positive to methamphetamine (0.02 mg/L), alprazolam (0.01 mg/L), codeine (0.14 mg/L), and THC (6 µg/L), all of which were in the therapeutic ranges. Clinically, she had a normal GCS and no respiratory depression. She was observed in the ED and subsequently discharged to home.

The highest codeine level detected was 0.93 mg/L which is well within the toxic range but lower than the lethal threshold. This female Caucasian aged between 18 and 35 years, had presented as a result of a deliberate overdose of Panadeine (paracetamol and codeine: 24 tablets), diazepam (47 tablets, strength unknown), and propranolol. The diazepam blood level was 1.3 mg/L and nordiazepam 1.7 mg/L, both in the toxic range. This patient was unconscious (GCS 3), cyanosed, hypotensive, and hypothermic. She was intubated and admitted to intensive care but was able to be discharged from hospital within 24 hours.

Table 180: Comparison of highest detected blood opioid levels with therapeutic and toxic ranges.

Drug Name	Blood Level	Therapeutic Range	Toxic Range
Codeine	0.93	0.01 – 0.05	0.3 – 1 (L >1.6)
Morphine	0.59	0.01 – 0.12	0.15 – 0.5 (L 0.05 – 4)
Methadone	1	0.1 – 0.3	0.2 – 0.75 (L > 0.75)

(Concentrations all in mg/L. L = lethal levels. All ranges referenced from The International Association of Forensic Toxicologists, internet listing of Therapeutic and Toxic Drug Levels)[29]

Disposition from the ED:
Approximately 61% of patients testing positive to opioids were admitted to hospital from the ED (Table 181), a rate very similar to that for patients testing positive to benzodiazepines, and somewhat higher than that for other drug-positive groups (ranging from 53% for THC to 37% for amphetamines and GHB). Intensive care or high dependency admission was required in 23 patients (16%) including 1 patient requiring monitoring by the cardiologists. Ultimately, approximately 82% of patients had been discharged home from hospital by the time of completion of data entry (generally within 2 weeks of enrolment). Two patients died, 7 remained in in-patient psychiatric facilities, and 1 was in long-term rehabilitation.

Tables 181 and 182: Place to which patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total (%)
Discharged	58 (39)
Admitted	
EECU	42 (34)
General Ward	18 (12)
ICU/HDU	22 (15)
Cardiology	1 (1)
Psych. Ward	1 (1)
Transferred	6 (4)
Unknown	1 (1)

Disposition from Hospital	Total (%)
Home	122 (82)
Absconded	9 (6)
Psych services	7 (5)
SAPOL custody	5 (3)
Rehabilitation	1 (1)
Died	2 (1)
Other	2 (1)
Unknown	1 (1)

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit, Psych = Psychiatry, SAPOL = South Australian Police)

Fatalities:
There were two enrolled patients who died and who tested positive to an opioid. One, a male aged between 18 and 35 years presented via ambulance in full cardio-respiratory arrest following a presumed non-deliberate intravenous overdose of heroin. The second case died as a result of a deliberate poison ingestion as well as an overdose of several medications including Panadeine. Further details on both cases can be found in Section 3.1. “Overview and Combined Results: Fatalities”.

Summary:

Enrolments:

- Of the 1134 enrolled patients returning positive drug tests, a total of 149 patients (13%) tested positive to opioids.

Demographics:

- The overwhelming majority of patients were Caucasian (95%)
- Indigenous patients representing just 4% of all patients testing positive to opioids but the rate of opioid detection in Indigenous patients was 12%, similar to Caucasians
- The average age was 35.6 years, the oldest of all drug types
- 5 patients were less than 18 years of age, all testing positive to codeine
- The overall male to female ratio was 3 to 2; the gender ratio reversed in those less than 18 years of age
- Presentations were relatively evenly spread across the week and time of day
- Over 60% of drug exposures occurred at a private residence

- Only 2% of exposures occurred in a licensed premises, the lowest of any drug group.

Patterns of Drug Use:

- Rates of detection of opioids were similar to the pre-study estimates (13% compared to an estimated 10%)
- The majority presented as a result of Illicit Drug Use (56%)
- Most of those presenting as a result of Self-Harm were positive for codeine taken in combination with paracetamol
- No victims of Drink Spiking tested positive for an opiate
- 42% of opioid-positive tests were for codeine
- It was not possible to draw conclusions as to the rates of abuse of codeine
- Surprisingly low rates of heroin detection were thought likely due to rapid metabolism of the drug prior to blood sampling being able to be performed
- High rates of detection of morphine and methadone suggest a problem with diversion of these restricted prescription drugs
- 189 opioid positive drugs tests were returned in the 149 patients, with 37 patients (25%) testing positive to more than 1 opioid
- There were 342 tests positive for drugs other than opioids: 65% benzodiazepines, 13% alcohol, 11% THC, 7% psycho-stimulants
- 47% of patients had documentation of previous IDU; 23% were Hepatitis C positive.

3.3.6 Gamma Hydroxy Butyrate

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

Of the 1134 enrolled patients returning positive drug tests, 36 (3%) tested positive to GHB.

Demographic Details:
The large majority of GHB-positive patients were Caucasian, male, and aged between 18 and 35 years (Tables 183). The average age of the group was 28.3 years with no difference between the genders in terms of ages. One patient was aged less than 18 years. The nature of GHB use is seen in Table 184.

Table 183: Age range and gender of patients testing positive to GHB.

Age Range (years)	Male	Female	Total (%)
< 18	1		1 (2)
18 – 35	25	7	33 (92)
36 – 50	3		3 (8)
Total (%)	29 (80)	7 (20)	36 (100)

Table 184: Ethnicity and presentation category of patients testing positive to GHB.

	Presentation Category			
Ethnicity	Illicit Drug Use	Drink Spiking	Suspected/ Unknown	Total (%)
Caucasian	29	4	1	34 (95)
Other	2			2 (5)
Total (%)	31 (86)	4 (11)	1 (3)	36 (100)

Consistent with findings for the other drugs the majority presented during the weekend, however the time of day at which they presented was typically between midnight and mid-day, somewhat later than the other major drug groups (Table 185). All but 2 presentations travelled to hospital by ambulance.

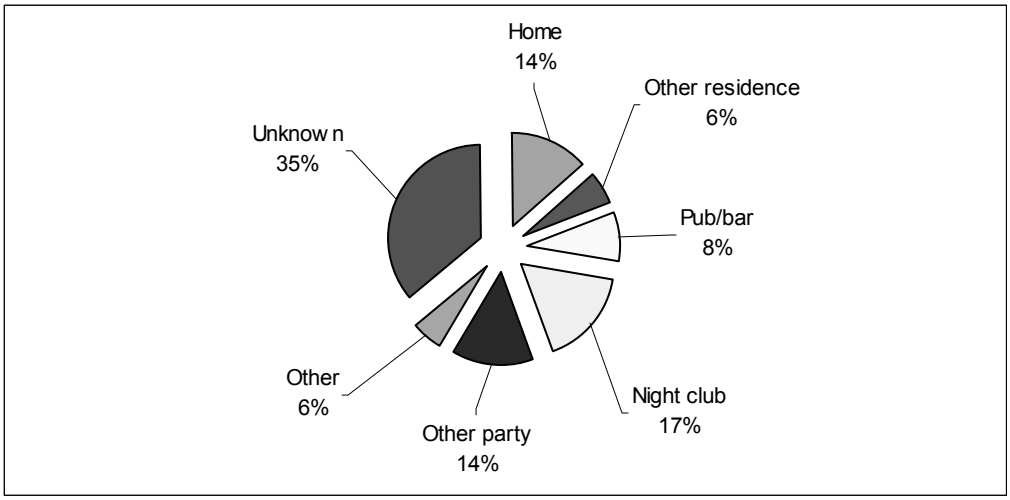
Table 185: Day and time of day of presentation to the ED of patients testing positive to GHB.

Time	Sun	Mon	Tues	Wed	Thur	Fri	Sat	Total
0001-0559	1	1			3	1	4	10
0600-1159	4	2					1	7
1200-1759			1					1
1800-2400					1			1
Total	5	3	1		4	1	5	19

(Phase 2 data only, *n* = 19)

The exposure to GHB occurred in a licensed venue (pub/bar or night club) in only 9 of the 36 patients (25%), whilst exposure occurred in a private residence in 7 cases (20%, Figure 41).

Figure 45: Venue of exposure to GHB (n = 36).



Patterns of Drug Use:

The large majority (31 of 36 patients, 86%) of the presentations were as a result of Illicit Drug Use (Table 184); 4 patients presented as a result of Drink Spiking, and 1 'Unknown/Suspected Drug Use'.

As has been the case with all other drug categories examined, poly-substance abuse was a feature of those testing positive to GHB, with only 11 (31%) of the GHB-positive patients testing positive for this drug alone (Table 186). A total of 74 tests positive for drugs other than GHB were returned in the remaining 25 patients (Table 187). The most common of these was an amphetamine, particularly methamphetamine, whilst alcohol, benzodiazepines and THC were much less frequently seen. This contrasts with the other drug groups examined in which these 3 drugs were predominant; the exception was patients testing positive to cocaine who also had a relatively high rate of amphetamine positive results. It also contrasts with the stated frequency of drug use by patients testing positive to GHB (Table 188), which might indicate that alcohol at least, might be expected to have been detected more frequently.

Table 186: Number of occasions GHB was detected alone or in combination with other drugs.

Number of Drugs	Number of Patients (%)
GHB only	11 (31)
GHB + 1 other	9 (25)
GHB + 2 others	9 (25)
GHB + 3 others	6 (17)
GHB + >3 others	1 (3)
Total	36

Table 187: Incidence of other drugs detected in patients positive for GHB.

Drugs Detected	Number of Positive Tests
Methamphetamine	28
MDMA	13
Amphetamine	8
Nordiazepam	8
THC	6
Alcohol	3
Morphine	2
Venlafaxine	2
Codeine	1
Oxazepam	1
Benzylecognine/cocaine	1
MDA	1
Total	74

As discussed in Section 3.2.3. “Drink Spiking”, 3 of the 4 victims of Drink Spiking who tested positive to GHB also tested positive to another drug. All 3 of these patients tested positive to an amphetamine, whilst only 1 returned a positive benzodiazepine test, and none tested positive to alcohol (see Table 67).

Table 188: Frequency of drug use reported by patients testing positive to GHB.

	Frequency of Use						
Reported Drug Use	Daily	Week	Month	Year	Not specified*	Past use only	Total Responses
GHB/Fantasy	1	2	4		5		12
Alcohol	1	6	2		1	1	11
Cigarettes	7	1				1	9
Benzodiazepines	1						1
Cannabis	4						4
Amphetamines	2	2	1				5
Methamphetamine	1		1				2
MDMA (ecstasy)			1		2		3
Heroin					2		2
Cocaine			1				1
Ketamine				2	1		3

(*Stated drug used but frequency of use not stated)

Clinical Correlates:
Relevant data on the clinical correlates for patients testing positive for GHB has also been reviewed in "Clinical Correlates" of Section 3.1.

The most common primary, clinical reason for attending the ED was classified by treating staff as collapse with altered conscious state (11 of 19 patients (58%) in Phase 2, Table 189). This is in keeping with the major clinical effect of GHB as a potent general anaesthetic agent. The next most common reason for presentation was for 'psychosocial reasons' related to drug use including 'situational crisis' and behavioural issues such as violence or threatening behaviour.

Table 189: Primary clinical reason for presentation to the ED.

System of Presenting Complaint	Detail	Number of Patients
Neurological	altered consciousness	11
Psycho-social	drugs misuse	7
CVS	conscious collapse	1

(Phase 2 data only, *n* = 19)

All but 2 of the patients were assigned a triage category of 1 or 2, indicating a severity of illness on arrival to hospital requiring immediate or urgent (within 10 minutes) medical assessment. This was in marked contrast to the other drug categories and indicates a much higher average acuity level at the time of presentation.

The drugs that were reported to, or otherwise suspected by, the treating staff as having been used by the patients immediately prior to presentation are shown in Table 190. In general, the suspicion or reporting of GHB use was reasonably accurate. However, the concomitant use of the amphetamines was under-reported whilst the use of alcohol was over-reported.

Table 190: Number of patients reported to, or otherwise suspected by, clinical staff to have used the listed drugs immediately prior to presentation to the ED.

Drug Suspected	Illicit Drug Use	Drink Spiking	Unknown/ Suspected
Unknown	3	3	1
Alcohol	9	0	0
Cannabis	5		
Cocaine	1		
GHB	25	1	
Ketamine	5		
Methamphetamine	5		
MDMA	4	2	
Diazepam	1		

Review of the clinical vital signs (Tables 191, 192) revealed a much higher rate of bradycardia (heart rate less than 60 bpm) amongst patients testing positive to GHB (11 of 36, 31%) than patients from the other drug categories (eg compared to a rate of 5% for opiate-positive patients). ECG's performed in 31 of the 36 patients showed that in all the bradycardic cases the rhythm was sinus. One patient had atrial fibrillation with a heart rate of between 100 and 150 bpm, whilst 3 others had sinus tachycardia.

Tables 191& 192: Clinical vital signs measured in patients testing positive to GHB.

Pulse Rate	No. Patients
Not recorded	3
<60	11
60-100 (NR)	18
101-150	4

Systolic BP	No. Patients
Not recorded	1
90-150 (NR)	35
150-200	
>200	

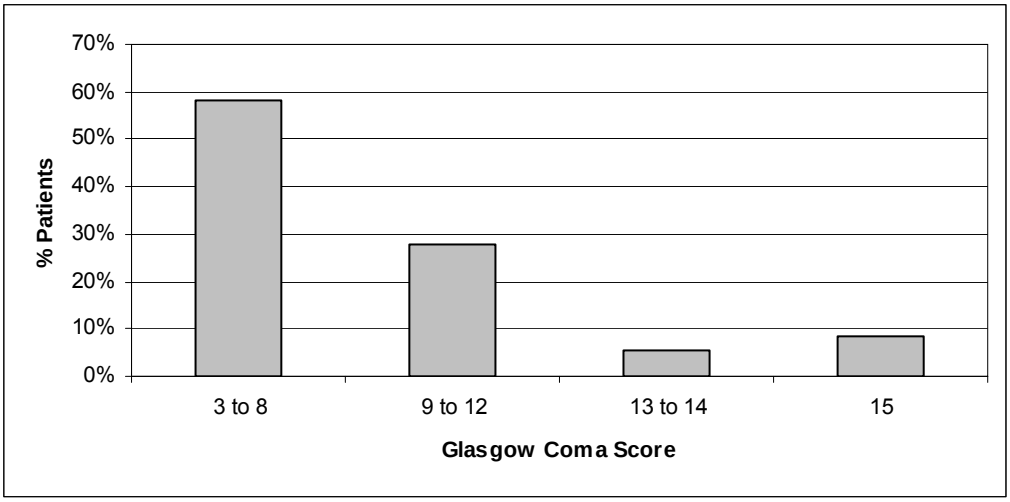
RR	No. Patients
Not recorded	6
<10	4
10 to 20 (NR)	24
21-30	2

Oxygen Saturation	No. Patients
Not recorded	7
85-90	
91-95	7
96-100 (NR)	22

(BP = blood pressure, NR = normal range, RR = respiratory rate)

GHB-positive patients had a much lower GCS at presentation than any other drug group (Figure 42). Seven patients had a GCS of 3 (19% of group), and 21 (58%) had a GCS of 8 or less (severe depression of conscious levels). This distribution across the GCS score ranges in Figure 42 is almost the reverse of that seen with other drug groups (Figures 25, 29, 33, 37, 40).

Figure 46: Conscious levels of patients testing positive to GHB as measured by the Glasgow Coma Score: 3 to 8, severe depression of conscious state; 9 to 12, moderate depression; 13 to 14, mild depression; 15 normal conscious state.



The quantitative analysis of GHB-positive patients revealed 58% still had toxic levels at the time of blood sampling in the ED, 1 of which was above the potentially lethal threshold (Table 193).

Table 193: Blood concentration ranges of patients testing positive for GHB.

Blood Concentration Range (mg/L)		Number of Patients
Sub-therapeutic	(< 50)	2
Therapeutic	(50 – 120)	13
Toxic	(120 – 250)	20
Lethal	(> 250)	1
Total		36

The highest GHB level recorded was 300 mg/L in a male Caucasian aged between 36 and 50 years who presented as a result of Illicit Drug Use. The venue of exposure was a motel room. Naloxone given by ambulance staff had no clinical effect. On arrival at the ED he was unconscious with a GCS of 3, had a significant sinus bradycardia of 45 bpm, and had small pupils of 2 mm diameter. ECG revealed a sinus bradycardia. The treating staff were told he had ingested approximately 20 ml of an unknown liquid and 3 pills, thought to be MDMA. The patient was intubated and admitted to Intensive Care. He recovered sufficiently to be discharged from hospital the following day.

Tables 194 and 195: Place to which patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total (%)
Discharged	23 (64)
EECU	1 (3)
ICU/HDU	12 (33)

Disposition from Hospital	Total (%)
Home	35 (97)
Absconded	1 (3)

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit)

Overall, 28% of patients who tested positive for GHB required intubation for airway management and 33% required admission to the Intensive Care Unit or High Dependency, the highest of any drug group (Tables 194 & 195). Despite this, all patients survived and were able to be discharged in under 24 hours (1 patient discharged himself against medical advice).

Two cases were administered physostigmine in the ED shortly after their arrival. Both were Caucasian males, aged 29 (case 1) and 23(case 2) respectively. They had reportedly taken GHB for 'recreational' purposes. Case 1 had reportedly also ingested alcohol, ketamine and THC. Toxicological examination was positive for GHB only, in both cases. Both were in the toxic range for GHB (120-250) with case 1 having a level of 197 and case 2, 147. Both cases were given a triage priority of 1 on arrival and treated in the resuscitation rooms. Clinical details for case 2 were sketchy, other than that he had a GCS of 6, briskly reacting pupils and a respiratory rate of 24. He was in sinus rhythm with some ST elevation. He was noted to have some focal seizure activity. Case 1 also had a GCS of 6 on arrival, with sluggish pupils, depressed gag and tendon reflexes. He was in atrial fibrillation, but haemodynamically stable.

Case 1 required endotracheal intubation. Both were admitted to the ICU/HDU, but discharged from there within 13 and 8 hours, respectively.

The clinical effect of physostigmine in these two cases is uncertain as are the reasons for it's use here and not in other, similar cases. This may relate to differences in individual clinician practice, awareness of a possible role for the drug in GHB overdose, or to debate over its effectiveness.

Summary:

Enrolments:

- Of the 1134 enrolled patients returning positive drug tests, 36 (3%) tested positive to GHB.

Demographics:

- The average age of patients was 28.3 years; 1 patient was less than 18 years of age
- 95% were Caucasian
- The most likely time of presentation was somewhat later than other drug groups, between midnight and mid-day; the majority presented over the weekend
- 25% of exposures occurred in a licensed premises whilst 20% occurred in a private residence.

Patterns of Drug Use:

- The large majority (31 of 36 patients, 86%) of the presentations were as a result of Illicit Drug Use; 4 patients presented as a result of Drink Spiking
- 11 patients (31%) tested positive to GHB alone
- A total of 74 tests positive for drugs other than GHB were returned in the remaining 25 patients
- The most common additional drugs detected were psycho-stimulants, particularly methamphetamine
- In contrast to other drug groups alcohol, THC and benzodiazepines were relatively infrequently detected in combination with GHB
- Patients typically presented as a result of collapse with an altered conscious level
- 58% of patients had blood levels in the toxic range at the time of sampling
- 2 cases received physostigmine, the clinical effects of which are unclear.

3.3.7 Cocaine

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

Of the 1134 enrolled patients returning positive drug tests 8 (0.7%) tested positive for cocaine or its metabolite benzylecognine.

Demographic Details:
All the patients testing positive to either compound were Caucasian. Five were male and 3 female, and the average age was 26.5 years. A clear pattern of presentation according to time of day or day of the week was not evident with such small numbers. Similarly, little comment could be made about patterns surrounding venue of drug exposure.

Patterns of Drug Use:
Illicit Drug Use was cited in 6 of the 8 cases, with the remaining 2 enrolled as drug exposure associated with deliberate Self-Harm. Samples were tested for both cocaine and its major metabolite, benzylecognine. The presence of the former suggests use within hours of sampling whilst the latter is indicative of use within the previous 24 hours[34]. Three patients tested positive for benzylecognine only, whilst the remainder were positive for either cocaine alone or for both cocaine and benzylecognine.

The average blood level of cocaine in the 6 Illicit Drug Users was 0.24 mg/L, and ranged up to 0.45 mg/L. The quoted ranges for toxicity (0.25 to 5 mg/L) and lethal threshold (1 to 20 mg/L) for cocaine are very broad, reflecting the fact that death from the effects of cocaine alone are rare. Cocaine has been found to be the primary underlying cause of death in 25% of all cocaine related deaths[35] with other factors and other drugs involved in other cases.

Poly-drug use was again prominent. Cocaine and/or benzylecognine were found in isolation in only 1 case (Table 196). Amphetamines and benzodiazepines were the most frequently detected, whilst alcohol was detected in only 1 patient (Table 197).

Table 196: Number of substances found in patients positive for cocaine or benzylecognine.

Number of Drugs	Number of Patients
Cocaine only	1
Cocaine + 1 other	3
Cocaine + 2 others	2
Cocaine + 3 others	2

Table 197: Drugs present in patients testing positive to cocaine or benzylecognine.

Other Drugs Detected	Number of Patients
Benzodiazepine	4
Alcohol	1
Amphetamines (Class)	
Methamphetamine	4
Amphetamine	1
MDMA	2
GHB	1
Antipsychotic/Antidepressant	1

Three patients had documented previous injecting drug use, one being hepatitis C positive.

Clinical Correlates:
A past medical history of psychiatric illness was reported in 4 of the 8 patients (50%); 3 of these 4 also had a documented past history of drug abuse or dependency.

The primary clinical reasons for attending the ED ranged from an unconscious collapse, and a potentially serious case of chest pain of possible cardiac origin, to a psycho-social "situational crisis". The allocated triage categories for the 8 patients were all toward the more urgent end of the scale, with 1 patient assessed as requiring immediate management (Table 198).

Table 198: Distribution of allocated triage categories for cocaine/benzylecognine-positive patients.

Triage Category	Number of Patients
1	1
2	3
3	4
Total	8

In keeping with the known clinical effects of cocaine, the most common abnormalities of recorded vital signs were a sinus tachycardia and moderate hypertension (Tables 199 and 200). One patient had marked depression in respiratory function in association with profound depression of conscious state (GCS 3) and required intensive care admission.

Tables 199 and 200: Clinical vital signs measures in patients testing positive for cocaine.

Pulse Rate	No. Patients
60-100 (NR)	5
101-150	3

Systolic BP	No. Patients
90-150 (NR)	6
150-200	2

RR	No. Patients
Not recorded	1
10 to 20 (NR)	5
21-30	2

Oxygen Saturation	No. Patients
Not recorded	1
91-95	1
96-100 (NR)	6

(BP = blood pressure, NR = normal range, RR = respiratory rate)

Summary:

- Of the 1134 enrolled patients returning positive drug tests 8 (0.7%) tested positive for cocaine or its metabolite benzylecognine
- All the patients testing positive to either compound were Caucasian
- All patients were aged between 18 and 35 years
- 5 were male and 3 female
- 6 of the 8 patients were reported to have used the drug in the category of Illicit Drug Use, 2 in association with deliberate Self-Harm
- All but 1 patient tested positive to other drugs mostly benzodiazepines and amphetamines
- Three patients had documented previous injecting drug use, one being Hepatitis C positive

3.3.8 Ketamine

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

Of the 1134 enrolled patients returning positive drug tests, 6 (0.5%) tested positive for ketamine.

Demographic Details:
Patients testing positive for ketamine were all Caucasian, and were equally divided between the genders. The average age was 24.7 years, the lowest of any of the drug groups; 1 patient was less than 18 years of age. There was almost 3.5 years difference between the average ages of the genders (male average age 26.5 years and female 23.0 years), the largest difference of any of the drug types.

Patterns of Drug Use:
All but 1 of the 6 patients testing positive to ketamine presented following Illicit Drug Use (83%). The other case was enrolled as Unknown/Suspected drug use as it was not clear at the time if drugs of abuse were involved. However, the intent was clearly self-harm as the patient had hanged themselves.

This latter case was administered ketamine as a part of the clinical emergency management shortly after arrival in the ED. Unfortunately, it has not been possible to determine if the blood sampling for the purposes of the study was performed before or after this treatment. It is therefore possible that ketamine was not used by the patient prior to presentation, that it was present only as a result of their treatment in hospital. This might be supported by the fact that there was no known previous history of illicit drug use by the patient, however very high THC levels were detected. The highest blood ketamine level detected (2 mg/L) was this case.

If the above case is excluded, the average ketamine blood level was 0.1 mg/L, which is surprisingly low (therapeutic range 0.5 to 6.5 mg/L). This may reflect the relatively rapid metabolism of the drug with a delayed period of time between drug exposure and presentation to the ED. Alternatively, it may also be due to ingestion of relatively low doses.

No patient tested positive to ketamine only, with up to 3 other drugs being detected in the one patient (Table 201). Alcohol was present in all of the Illicit Drug Users, and an amphetamine in 3 of the 5 (Table 202).

Table 201: Number of substances found in patients positive for ketamine.

Number of Drugs	Number of Patients (%)
Ketamine only	0
Ketamine + 1 other	2 (33%)
Ketamine + 2 others	3 (50%)
Ketamine + 3 others	1 17%)

Table 202: Drugs present in patients testing positive to ketamine.

Drug Detected	Total Number of Positive Tests
Alcohol	5
Methamphetamine	2
Nordiazepam	1
MDMA	1
THC	2

No patients were recorded as being IV drug users or of having a transmissible viral disease.

Clinical Correlates:
The primary clinical reason for attending the ED varied from attempted suicide by hanging to 'psycho-social drug misuse'. Distribution of allocated triage categories for ketamine-positive patients was similarly broad with only the hanging determined to require immediate management, 2 cases assessed as urgent, and the remainder non-urgent.

Review of the clinical vital signs of these patients showed little in the way of abnormalities. A mild sinus tachycardia (heart rate > 100 beats per minute) was, once again, the most common. The Glasgow Coma Scores are shown in Table 205.

Tables 203 and 204: Clinical vital signs measures in patients testing positive for ketamine.

Pulse Rate	No. Patients
60-100 (NR)	3
101-150	3
Systolic BP	**No. Patients**
90-150 (NR)	5
150-200	1

RR	No. Patients
Not recorded	1
10 to 20 (NR)	4
21-30	1
Oxygen Saturation	**No. Patients**
Not recorded	1
91-95	1
96-100 (NR)	4

(BP = blood pressure, NR = normal range, RR = respiratory rate)

Table 205: Conscious levels of patients as measured by the Glasgow Coma Score (GCS): 3 to 8 (severe), 9 to 12 (moderate), 13 to 14 (mild), 15 (normal).

GCS	Number of Patients (%)
8	1 (17%)
13	2 (33%)
15	3 (50%)

Tables 206 and 207 show the places to which patients were discharged from the ED and from the hospital following treatment. Only 1 patient required admission to hospital; 4 others were discharged to home from the ED and 1 patient left against medical advice. One patient was

admitted to the ICU/HDU and subsequently died within 2-7 days of admission due to the effects of hanging.

Tables 206 and 207: Place to which patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total (%)
Discharged	5 (83)
Admitted	
ICU/HDU	1 (17)

Disposition from Hospital	Total (%)
Home	4 (66)
Absconded	1 (17)
Died	1 (17)

(ICU = Intensive Care Unit, HDU = High dependency Unit)

Summary:

- Of the 1134 enrolled patients returning positive drug tests, 6 (0.5%) tested positive for ketamine
- All were Caucasian
- All but 1 presented as a result of Illicit Drug Use; the remaining case may have received the drug as part of their medical management
- All tested positive to multiple drugs; all tested positive to alcohol, 3 to an amphetamine
- None had a previous known history of IDU.

3.3.9 LSD

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

Of the 1134 enrolled patients returning positive drug tests, 5 (0.4%) tested positive to LSD. However, testing for LSD only commenced in March 2005 after several presentations to the ED in a short period indicated that LSD use was an emerging phenomenon. A health advisory "D_2EWS Alert" was published as a result of this cluster of LSD-related presentations (see Appendix B, "Drug Alert" number 2), and monitoring of drug prevalence in our enrolled patients commenced. Due to technical difficulties in the quantification of the minute amounts of LSD generally present in affected patients, only a qualitative screen of enrolled patients was performed and LSD blood concentrations were not measured.

Demographic Details:
All the patients testing positive for LSD were Caucasian males. Two of the five (40%) were aged less than 18 years and the average age of the group was 25.6 years. Consistent with findings for the other illicit drugs the majority presented during the weekend, however the time of day at which they presented was variable, with no pattern evident from the small number of patients (Table 208). All presentations travelled to hospital by ambulance.

Table 208: Day and time of presentation to the ED of patients testing positive to LSD.

Time	Sun	Tues	Fri	Sat	Total (%)
0001-0559		1	1		2 (40%
0600-1159	1			1	2 (40%)
1200-1759				1	1 (20%)
Total (%)	1	1	1	2	5

(Phase 2 data only)

A widely held perception is that LSD use is particularly associated with the "Rave" party scene, and the drug exposure of the initial 2 presentations occurred at the "Two Tribes" rave party. Interestingly however, there were no LSD-positive enrolments from the Enchanted Forest winter and summer rave parties; the remaining 4 patients took the drug either at their own home or another place of residence.

Patterns of Drug Use:
All of the presentations cited their use of LSD as Illicit Drug Use, and poly-substance use was once again a feature (Table 209).

Table 209: Other drugs detected in those positive for LSD.

Number of Drugs	Number of Patients (%)
LSD only	2 (40%)
LSD + alcohol + antidepressant	1 (20%)
LSD + Methamphetamine	1 (20%)
LSD + MDMA	1 (20%)

Clinical Correlates:
Relevant data on the clinical correlates for patients testing positive for LSD has also been reviewed in "Clinical Correlates" of Section 3.1.

The primary clinical reason for attending the ED was classified by treating staff as 'psycho-social' related to drug misuse. These presentations included 'situational crisis' and behavioural issues such as violence or threatening behaviour requiring police intervention. All 5 patients were assigned moderate levels of urgency for assessment and management (triage category 3 or 4) on arrival at the ED. Two patients were noted to have a past history of psychiatric illness and one a formal diagnosis of drug abuse or dependency.

Review of the clinical vital signs of these patients showed little in the way of clinically significant abnormalities. A mild sinus tachycardia (heart rate > 100 beats per minute) was the most common, and may have been related to the agitated behaviour rather than a primary drug effect. All patients had a Glasgow Coma Score of 15 at presentation. One patient suffered a grand mal seizure; the cause of the fit and its significance in relation to the ingestion of LSD is uncertain.

Only 1 patient required admission to hospital (this patient later left hospital against medical advice); the other 4 were discharged to home from the ED.

Summary:

- Testing for LSD commenced in March 2005 after several presentations to the ED occurred in a short space of time suggesting a rapid rise in its use
- Of the 1134 enrolled patients returning positive drug tests, 5 (0.4%) tested positive to LSD
- All the patients testing positive for LSD were Caucasian males.
- 2 patients were less than 18 years of age
- The majority presented over the weekend but time of day of presentation was variable
- Only 2 of the presentations were related to "Rave Parties", drug exposure in the remainder occurred at a private residence
- LSD use in all cases fell into the Illicit Drug Use category
- 2 patients tested positive to LSD alone.

3.3.10 Antidepressants and Antipsychotics

Enrolments:
Results and discussion in this and the following sections are limited to drug positive enrolments only.

Of the 1134 enrolled drug-positive patients, 130 tested positive for antidepressants (11%), with a total number of 140 positive tests. Thirty three of the 1134 enrolled patients tested positive for antipsychotics (3%) with a total of 35 positive tests. Not surprisingly, the largest proportion positive for both types of drugs was seen in the deliberate Self-Harm group, with 29% testing positive for antidepressants and 10% for antipsychotics (see Table 210).

Table 210: Number of antidepressant- and antipsychotic-positive patients by presentation category.

Presentation Category	Antidepressants Total (%)	Antipsychotics Total (%)	Combined Total (%)
Self-Harm	82 (63)	28 (85)	110 (68)
Illicit Drug Use	36 (28)	4 (12)	40 (25)
Accidental Poisoning	3 (2)		3 (2)
Drink Spiking	2 (2)	1 (3)	3 (2)
Unknown/Suspected	7 (5)		7 (4)
Total	130	33	163

Demographic Details:
Ethnicity:
All enrolments that tested positive for antipsychotics, and 94% of antidepressant positive enrolments were Caucasian. One patient testing positive for antidepressants identified as Indigenous (Table 211).

Table 211: Ethnicity of patients testing positive to antidepressants and antipsychotics.

Ethnicity	Antidepressants Total (%)	Antipsychotics Total (%)
Caucasian	122 (94)	33 (100)
Indigenous	1 (0.8)	
Other	4 (3)	
Total	130	33

Age and Gender:
The majority of patients for both types of drugs were aged between 18-35 years (antidepressants 63%, antipsychotics 79%). Five percent (7 patients) of those positive for antidepressants were aged less than 18 years.

There was a striking difference between the two groups in terms of gender spread. Females outnumbered males 2:1 in the antidepressants group (67:33%), whereas the ratio was almost equal in the antipsychotics group (49% males compared to 51% females) (Figures 47 & 48).

Figure 47: Age and gender distribution of patients testing positive to antidepressants.

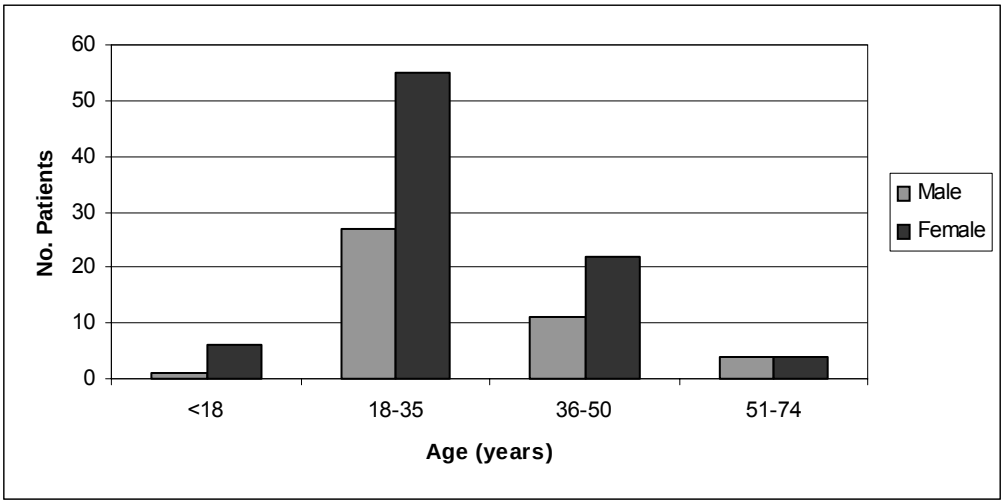
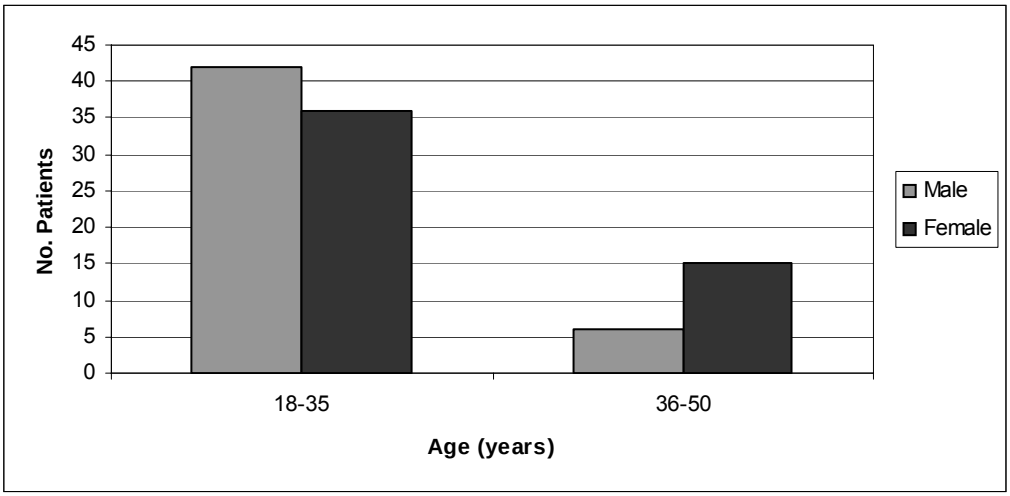


Figure 48: Age and gender distribution of patients testing positive to antipsychotics.

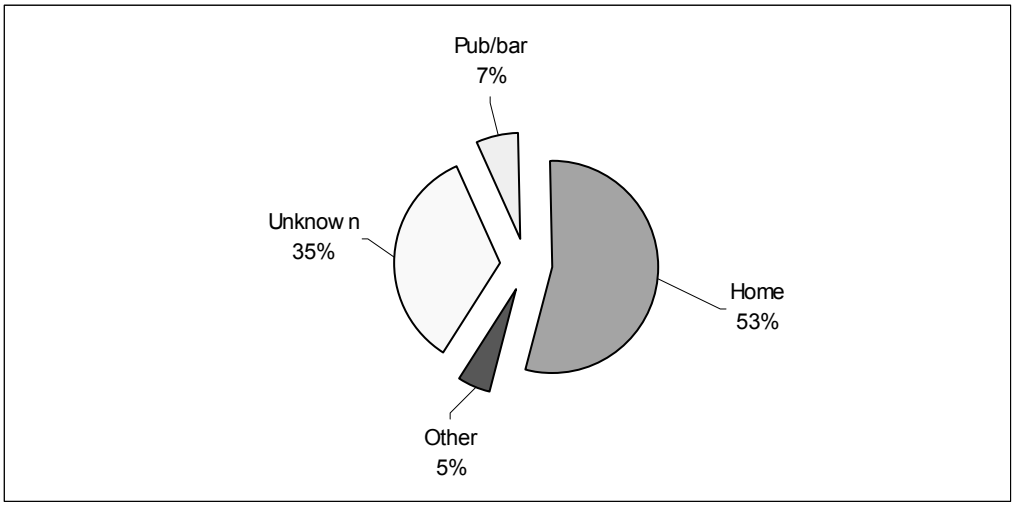


Time of Presentation:
Time of presentation for antidepressants was fairly evenly spread through the days of the week and the time of day; 30% presented on the weekend; 68% of those testing positive for antipsychotics presented between 1800 and 0600; 36% presented on the weekend.

There appeared to be an increase in antidepressant positive presentations in the winter (28%) and autumn months (32%) compared to spring (18%) and summer (23%). Summer (36%) and winter (30%) presentations were the most common for those positive for antipsychotics, with spring (12%) the lowest.

Venue of exposure and mode of transport to ED:
Most antidepressant and antipsychotics drug exposure took place at home or another residence (55% and 49% respectively). Nine percent of antidepressant exposures took place in a licensed premise. The location was unknown in 42% of cases involving antipsychotics and 32% of antidepressants.

Figure 49: Venue of ingestion of antidepressants and antipsychotics.



Mode of arrival to the ED was mostly via ambulance services (Table 212). This is broadly consistent with mode of arrival patterns seen in other enrolment categories but is different from ED attendances in general. Ambulance and private vehicle transport rates for all patients attending the ED are approximately 41% and 39% respectively.

Table 212: Mode of arrival to the ED for patients testing positive to antidepressants and antipsychotics.

Mode of Arrival	Number of Patients (%)	
	Antidepressants	Antipsychotics
Ambulance	68 (81)	18 (82)
Police/Custodial	1 (1)	
Private car	14 (17)	3 (14)
Other	1 (1)	1 (4)
Total	84	22

(Phase 2 only)

Patterns of Drug Use:

Antidepressants were most commonly detected in the Self-Harm group (accounting for 64%), followed by the Illicit Drug Use group (27%, Table 213). The nature of the use of the antidepressant was not always clear and there may be cases where it was taken as a licit prescription drug. As discussed elsewhere, there may be instances where antidepressants are used illicitly, especially in conjunction with amphetamines. A similar pattern is seen in the antipsychotic group, with Self-Harm accounting for 85% of all cases and Illicit Drug Use for 12% (Table 214).

Table 213: Antidepressants detected in each of the enrolment categories.

Drug	Self-Harm	Illicit Drug Use	Drink Spiking	Other	Total (%)
Amitryptiline	7	2			9 (6)
Fluoxetine	7	5			12 (9)
Citalopram	26	9	1	5	41 (29)
Moclobemide	1				1 (1)
Mirtazapine	9	1			10 (7)
Sertraline	12	4	1	1	18 (13)
Venlafaxine	25	17	3	1	46 (33)
Raboxetine	1				1 (1)
Fluvoxamine	2				2 (1)
Total	90 (64)	38 (27)	5 (4)	7 (5)	140

Table 214: Antipsychotics detected in each of the presentation categories.

Drug Name	Self-Harm	Illicit Drug Use	Drink Spiking	Total (%)
Quetiapine	11	3		14 (41)
Olanzapine	11			11 (32)
Chlorpromazine	7		1	8 (24)
Clozapine		1		1 (3)
Total	29 (85)	4 (12)	1 (3)	34

Poly-substance was a feature of both drug groups (Table 215), with one drug being detected in only 11% of antidepressant cases and 6% of antipsychotic cases. More than 3 drugs were detected in approximately 20% of both groups.

Table 215: Number of drugs detected for each drug category.

Number of Drugs Detected	Antidepressants (%)	Antipsychotics (%)
1	15 (12)	2 (6)
2	40 (31)	16 (49)
3	45 (35)	8 (24)
> 3	30 (23)	7 (21)

A total of 271 positive tests for other drugs were returned in the antidepressant group, with the most common being benzodiazepines (44%) and alcohol (20%). Seventy five positive tests for other drugs were found for the antipsychotic group, with benzodiazepine and alcohol being the most common (55% and 13% respectively)(see Table 216).

Table 216: Drugs present in patients testing positive to antidepressants and antipsychotics.

Drug Detected	Number of Positive Tests	
	Antidepressants	Antipsychotics
Benzodiazepine	119	41
Alcohol	53	10
THC	16	6
Amphetamines (Class)	14	1
Opioids (Class)	33	5
GHB	2	0
Others	25	3
LSD	1	0
Antipsychotics	8	-
Antidepressants	-	8
Cocaine	0	1
Total	271	75

Drug Habit:
The pattern of drug use reported generally reflected the drugs detected. However alcohol and benzodiazepine use was under-reported in both groups. Opiate use was under-reported in the antipsychotic group.

The frequency of injecting drug abuse previously documented in case records of patients testing positive for both antidepressants and antipsychotics (16% and 21% respectively) was quite high (Table 217). Of these there was a surprisingly high incidence of hepatitis C, particularly in proportion to the number of cases of hepatitis B.

Table 217: Number of patients with previously documented injecting drug use and transmissible viral disease.

Behaviour	Antidepressants (%)	Antipsychotics (%)
IV Drug Use	20 (16)	7 (21)
Hepatitis B positive	0	0
Hepatitis C positive	8 (6)	3 (9)
HIV positive	0	1 (3)

Clinical Correlates:
Medical History:
A past history of psychiatric illness dominated in both categories, comprising on average 75% of the diagnoses recorded (Table 218). In both groups a history of drug abuse/dependency comprised 19% of the diagnoses. The relatively low number of significant medical diagnoses recorded may reflect the age of the patients.

Table 218: Incidence of past history of psychiatric, drug abuse/dependency, and chronic medical illness in antidepressant and antipsychotic-positive enrolled patients.

Recorded Past Medical/Psychiatric Illness	Antidepressants	Antipsychotics
Psychiatric Illness	139 (73)	46 (79)
Drug abuse or dependency	37 (19)	11 (19)
Other Significant Medical	15 (8)	1 (2)
Total number of recorded entries*	191	58

(*Patients may have had more than one medical or psychiatric condition. Data was not recorded for all patients enrolled)

Presenting Complaint:

The primary clinical reason for attending the ED in patients who tested positive for both antidepressants and antipsychotics was psychosocial (56% and 73% respectively). Poisoning was the next most common for both (16% and 14% respectively). Trauma accounted for 11% of antidepressant presentations (Table 219).

Table 219: Primary clinical reason for attending the ED as per presentation complaint.

System of Presenting Complaint	Antidepressants (%)	Antipsychotics (%)
CVS	7 (8)	1 (5)
Neuro	5 (6)	2 (9)
Drug	1 (1)	
GI	1 (10	
Poisoning	13 (16)	3 (14)
Psycho-social	47 (56)	16 (73)
Single trauma	4 (5)	
Multi-trauma	5 (6)	
Respiratory	1 (1)	
Total	84	22

(Phase 2 of study only. (CVS = cardiovascular system, GI = gastro-intestinal, OD = overdose, multi-trauma = trauma severity requiring trauma team assessment, single trauma = trauma severity not requiring trauma team assessment)

Triage Category:

There was little difference between those testing positive to antidepressants and to antipsychotics (52% and 57% respectively) with regards to a need for immediate or urgent attention upon arrival to the ED according to the triage priority allocated to them (Table 220).

Table 220: Distribution of allocated triage categories for antidepressant and antipsychotic-positive patients.

Drug Type	Triage Priority				
	1	2	3	4	5
Antidepressants	30 (23)	38 (29)	51 (39)	11 (9)	0
Antipsychotics	6 (18)	13 (39)	12 (36)	2 (6)	0

Number of patients (%)

Clinical Vital Signs:

The most common clinical abnormality was bradycardia (2% of antidepressant, 3% of antipsychotic positive patients) and hypertension in both categories (7% and 6% respectively). Data on recorded clinical vital signs is shown in Tables 221 and 222.

Tables 221 and 222: Clinical vital signs measures in patients testing positive for antidepressants and antipsychotics.

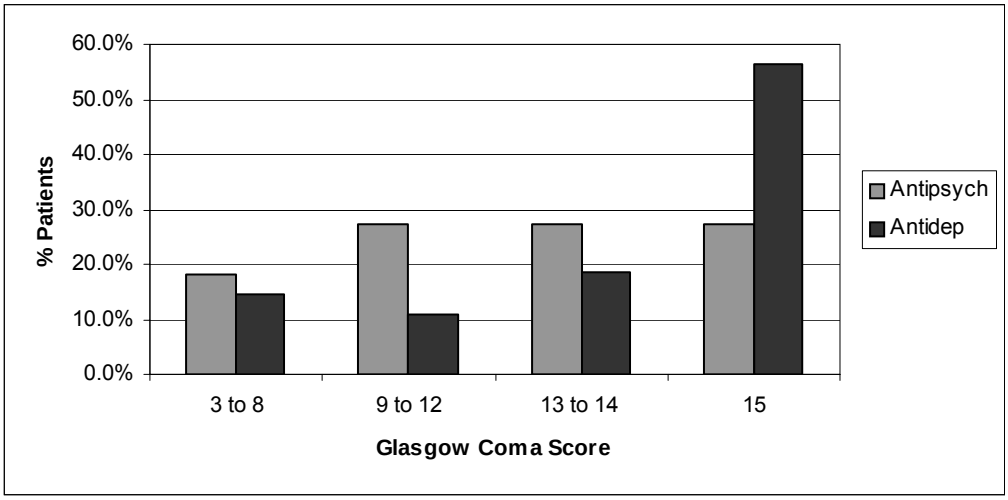
Pulse Rate	Antidepressants No. Patients (%)
Not recorded	5 (4)
<60	2 (2)
60-100 (NR)	85 (65)
101-150	37 (28)
>150	1 (1)
Systolic BP	**Antidepressants No. Patients (%)**
Not recorded	17 (13)
<90	1 (1)
90-150 (NR)	103 (79)
150-200	9 (7)
>200	-
Oxygen Saturation	**Antidepressants No. Patients (%)**
Not recorded	40 (31)
<85	-
85-90	1 (1)
91-95	15 (12)
96-100 (NR)	74 (57)
RR	**Antidepressants No. Patients (%)**
Not recorded	14 (11)
<10	3 (2)
10-30	113 (87)
>30	-

Pulse Rate	Antipsychotics No. Patients (%)
Not recorded	-
<60	1 (3)
60-100 (NR)	13 (39)
101-150	19 (58)
151-200	-
Systolic BP	**Antipsychotics No. Patients (%)**
Not recorded	2 (6)
<90	1 (3)
90-150 (NR)	28 (85)
150-200	2 (6)
>200	-
Oxygen Saturation	**Antipsychotics No. Patients (%)**
Not recorded	4 (12)
<85	-
86-90	-
91-95	5 (15)
96-100 (NR)	24 (73)
RR	**Antipsychotics No. Patients (%)**
Not recorded	6 (18)
<10	-
10-30	27 (82)
>30	-

(BP = blood pressure, NR = normal range, RR = respiratory rate)

The GCS allocated to patients testing positive to antidepressants and antipsychotics are depicted in Figure 46. The spread was fairly even for antipsychotics, with 19% scoring a GCS of 8 or less. The remainder were evenly spread with 27% in each category.
Of those positive for antidepressants 15% had a profoundly affected GCS, while just over half (56%) had a normal GCS.

Figure 50: Conscious levels of patients as measured by the Glasgow Coma Score (GCS): 3 to 8 (severe), 9 to 12 (moderate), 13 to 14 (mild), 15 (normal).



Disposition from the ED:
High proportions from both groups were admitted to hospital (68% of antidepressant-positive patients and 88% of antipsychotic positive), with substantial proportions admitted to ICU/HDU (20%, and 30% respectively) (Table 223). This indicates a high acuity and complexity for these presentations.

The vast majority of patients were discharged home within 24 hours of presentation to hospital (Table 224). Further psychiatric care was required in 11% of cases positive for antidepressants and 21% of those positive for antipsychotics.

Table 223: Disposition from the ED of patients testing positive to antidepressants and antipsychotics.

Disposition from ED	Number of Patients (%)	
	Antidepressants	Antipsychotics
Discharged	41 (32)	4 (12)
Admitted	89 (68)	21 (88)
EECU	41 (32)	16 (48)
General Ward	15 (12)	3 (9)
ICU/HDU	26 (20)	10 (30)
Cardiology	1 (1)	-
Psych. Ward	-	--
Transferred	4 (3)	-
Unknown	2 (2)	-

Table 224: Disposition from the Hospital for patients testing positive to antidepressants and antipsychotics.

Disposition from Hospital	Number of Patients (%)	
	Antidepressants	Antipsychotics
Home	107 (82)	24 (73)
Absconded	2 (2)	1 (3)
Psych services	14 (11)	7 (21)
SAPOL custody	1 (<1)	-
Rehabilitation	3 (2)	1 (3)
Other/Unknown	3 (2)	-

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit, Psych = Psychiatry, SAPOL = South Australian Police)

Summary:

Enrolments:

- Of the 1134 enrolled drug-positive patients, 130 tested positive for antidepressants (11%), 33 for antipsychotics (3%).

Demographics:

- Caucasians accounted for all antipsychotic positive enrolments and 94% of antidepressant positive enrolments
- The majority were between 18 and 35 years of age; 5% of those positive for antidepressants were less than 18 years of age
- Females outnumbered males 2 to 1 in the antidepressant group
- Most of the drug exposures occurred at a private residence.

Patterns of Drug Use:

- 64% of antidepressants were in association with Self-Harm, 27% with Illicit Drug Use
- 85% of antipsychotics were in association with Self-Harm, 12% with Illicit Drug Use
- Citalopram (29%) and Venlafaxine (33%) were the most frequently detected antidepressants, Olanzapine (32%) and Chlorpromazine (24%) the most frequent antipsychotics
- The majority of patients tested positive to more than 1 drug, with 22% testing positive to more than 3 drugs
- The most commonly detected drugs in the group were benzodiazepines, alcohol, and THC
- A past history of IDU was reported in 16% of antidepressant positive patients and 21% of antipsychotic positive patients.

SUPPLEMENT

S1 TRAUMA

Enrolments:

Results and discussion in this and the following sections, unless otherwise stated, are limited to drug positive enrolments only.

Collection of data specific to intoxicated or poisoned patients presenting as a result of trauma commenced in February 2005. Of the 1434 enrolled patients in the period February 2005 to February 2006 , a total of 1377 (96%) returned positive drug tests. Of these, 136 patients (10%) presented as a direct result of trauma. The most common cause of trauma was as a result of MVAs (72 patients or 53%, Table S1). The next most common cause of trauma was assault, which was less than half the rate of MVAs.

Table S1: Number of drug-affected patients presenting as a result of the various categories of trauma.

Nature of Trauma	Number of Patients (%)
MVA	72 (53)
Assault (all)	29 (21)
Assault with Blunt injury	19
Assault with Penetrating injury	10
Fall	12 (9)
Self-Harm	7 (5)
Other	16 (12)
Total	136

(MVA = motor vehicle accident)

Demographic Details:

Ethnicity, Age and Gender:

The overwhelming majority of patients were Caucasian (84%) with the next largest ethnic group being Indigenous patients representing just 7% (Table S2).

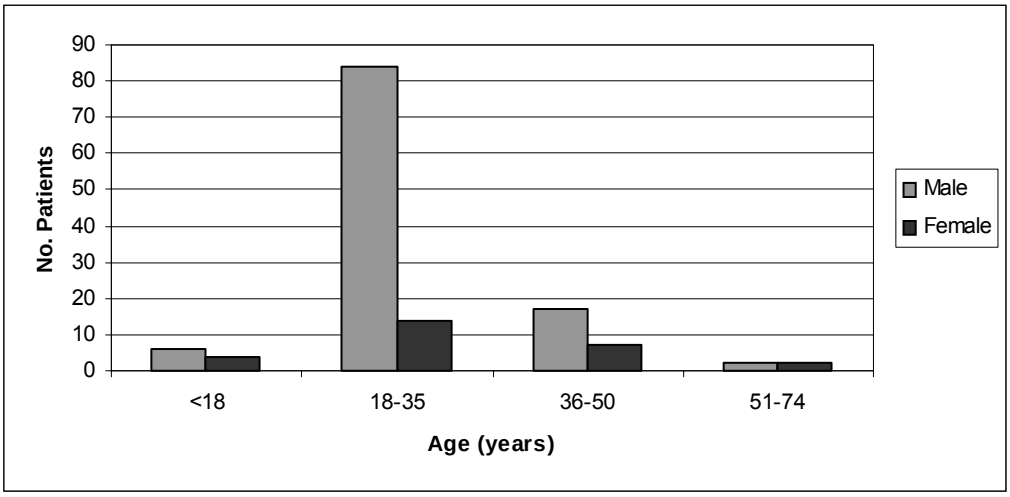
Table S2: Ethnicity of all drug-positive trauma patients and those presenting as a result of a MVA.

Ethnicity	All Trauma (%)	MVA (%)
Caucasian	114 (84)	61 (85)
Indigenous	10 (7)	4 (5)
Other	12 (8)	7 (10)
Total	136	72

Approximately 83% of patients were male and aged between 18 and 35 years (Figure S1). Ten patients (7% of the trauma group) were under 18 years of age. The male predominance held across all age groups except for those over 50 years of age, but numbers were very small in

this group (4 patients only). Similar ratios were seen in the MVA sub-group, with 10% of the group aged less than 18 years of age, and males predominating in all age ranges.

Figure S1: Age and gender distribution of all trauma patients testing positive to drugs.



Time of Presentation:

The most likely time of presentation for enrolled trauma patients was Sunday morning between midnight and 06:00 (18 of 136 patients or 13%, Table S3). Half of the patients presented on the weekend, between 6 pm Friday and 6 am Monday, and 64% presented 'after hours' (6 pm to 6 am). The figures for the MVA sub-group were similar (57% on the weekend, and 65% 'after-hours').

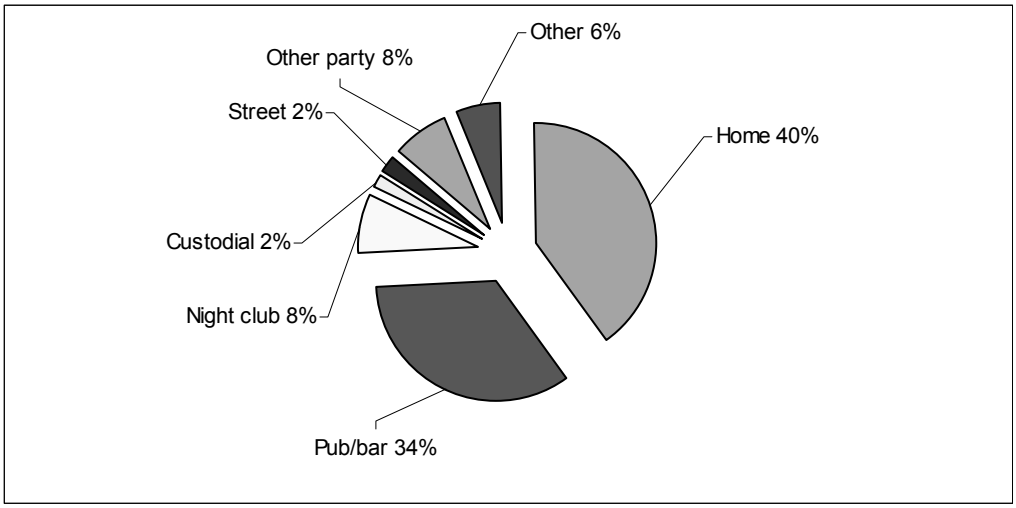
Table S3: Day and time of presentation to the ED of drug-affected patients presenting due to trauma.

Time	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Total (%)
0001-0559	18	5	4	5	5	6	13	56 (41)
0600-1159	3	5	1	5	2	4	7	27 (20)
1200-1759	5	5	1	3	3		5	22 (16)
1800-2400	2	4	7	3	5	8	2	31 (23)
Total (%)	28 (20)	19 (14)	13 (10)	16 (12)	15 (11)	18 (13)	27 (20)	136

Venue of exposure and mode of transport to ED:

The venue of drug exposure was recorded in only 50 of the 136 patients (37%) and is shown in Figure 2. Forty percent of the drug exposures in those for whom it was known, occurred in a private residence, whilst 42% of exposures occurred in a licensed premises.

Figure S2: Venue of drug exposure for trauma patients.



(n = 50)

Mode of transport to the ED was mostly via ambulance services (Table S4).

Table S4: Mode of arrival to the ED for trauma patients testing positive to a drug.

Mode of Arrival	Number of Patients (%)
Ambulance	129 (95)
Police/Custodial	2 (1)
Private car	1 (1)
Unknown/Other	4 (3)
Total	136

Patterns of Drug Use:

The majority of patients presented as a result of Illicit Drug Use (80%), with only a relatively small proportion presenting due to self- harm (Table S5). The majority of those classified as "Suspected/Unknown" are thought to be due to Illicit Drug Use, as the patterns of drug use seen in this category broadly match those in the Illicit Drug Use group (see Section 3.2.1. "Illicit Drug Use" and Section 3.2.4. "Unknown and Suspected drug Use").

Table S5: Distribution across the presentation categories of trauma patients testing positive to drugs.

	Number of Patients (%)	
Presentation Category	All Trauma	MVA
Illicit Drug Use	109 (80)	58 (80)
Self-Harm	8 (6)	3 (4)
Suspected/Unknown	19 (14)	11 (15)
Total	136	72

The frequency of detection of the major drug types associated with trauma is shown in Table S6. The relative detection rates of the major drug groups differs from that seen in enrolments generally, with higher rates of alcohol and THC but approximately half the detection rate of benzodiazepines, opioids and antidepressants.

Table S6: Comparison of the number of patients testing positive to the major drug types from MVAs, all trauma, and all drug-positive enrolments.

Drug Type	Number of Patients (%)		
	MVA	All Trauma	All Drug Positive Enrolments*
Alcohol	45 (63)	95 (43)	670 (59)
THC	25 (35)	51 (23)	259 (23)
Amphetamines	14 (19)	28 (13)	247 (22)
Benzodiazepines	12 (17)	22 (10)	397 (35)
Opioids	5 (7)	7 (3)	149 (13)
Antidepressants	5 (7)	7 (3)	130 (11)
Ketamine	3 (4)	3 (1)	6 (<1)
GHB	1 (1)	1 (1)	36(3)
Other	5 (7)	6 (3)	142 (13)

(*Data from period August 2004 to August 2005)

Poly-substance abuse was prominent in drug-affected trauma victims, with half of these patients testing positive for more than 1 drug (Table S7). The frequency of poly-substance abuse in trauma patients was a feature of this group, with 13% testing positive for 3 or more drugs. This is in comparison to the Illicit Drug Use group, where 27% had 3 or more drugs detected.

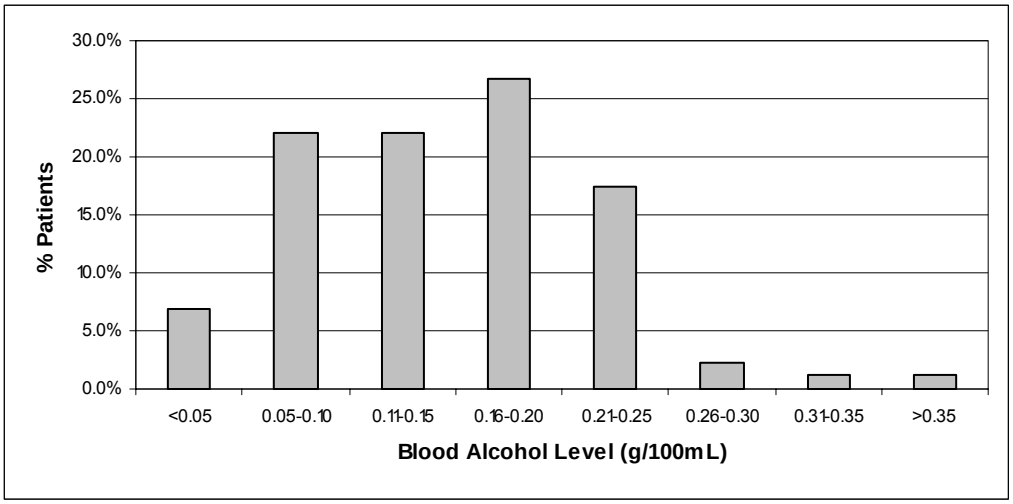
Table S7: Comparison of the number of patients from MVAs, all trauma patients, and patients enrolled in the Illicit Drug Use group, testing positive for 1 or more drugs.

Number of Drugs	Number of Patients (%)		
	MVA	All Trauma	Illicit Drug Use*
1	35 (49)	69 (51)	282 (41)
2	25 (35)	49 (36)	221 (32)
3	9 (12)	15 (11)	141 (21)
>3	3 (4)	3 (2)	43 (6)
Total	72	136	687

(*Presentation category: Data from period August 2004 to August 2005.)

A total of 244 positive drug results were returned from the 136 trauma patients (an average of 1.65 drugs per patient) and 128 from the MVA sub-group (an average of 1.78 drugs per patient). Alcohol was the most frequently detected drug, followed by THC, amphetamines and benzodiazepines. The alcohol levels detected are shown in Figure S3. Ninety six percent of those in the MVA sub-group that tested positive to alcohol (43 of 45 patients) were over 0.05 g/100mL, the legal limit for driving in South Australia.

Figure S3: Blood alcohol concentration ranges of patients presenting as a result of trauma.



Of the amphetamines, methamphetamine was the most frequently detected, both in all trauma patients and in patients from MVAs (approximately. 50%) with MDMA the next most frequent (28%, Table S8). As discussed in Section 3.3.2. “Amphetamines”, the MDA and MDEA were most likely additives to MDMA tablets, and a large proportion of amphetamine results will have been as a result of metabolism of methamphetamine. Consequently, the total number of psycho-stimulant exposures may be as low as 33.

Table S8: Frequency of amphetamine detection in trauma patients.

Drugs Detected	Number of Positive Tests	
	MVA	All Trauma
Amphetamine group	21	42
Methamphetamine	10	22
MDMA	7	11
Amphetamine	2	7
MDA	1	1
MDEA	1	1

Nordiazepam (main metabolite of diazepam) was the most frequently detected benzodiazepine (20 positive results) followed by oxazepam (4), temazepam (3), and nitrazepam and alprazolam (2 each). Additionally, there were 7 positive drug results returned for antidepressants (citalopram 4, venlafaxine 2, and sertraline 1).

Clinical Correlates:

The triage categories allocated to drug-affected trauma patients on presentation to the ED are shown in Table S9. The overwhelming majority were allocated triage categories 1 and 2 indicating a need for immediate or urgent (less than 10 minutes) medical assessment and management. A comparison with the triage categories allocated to drug-positive enrolments generally suggests a much higher acuity of illness amongst intoxicated trauma patients than is the case for other causes of presentation of intoxicated patients. However, a specific set of triage criteria is applied to victims of trauma presenting to the RAH, and it is likely that trauma patients generally have a different distribution across the triage scale. Unfortunately a

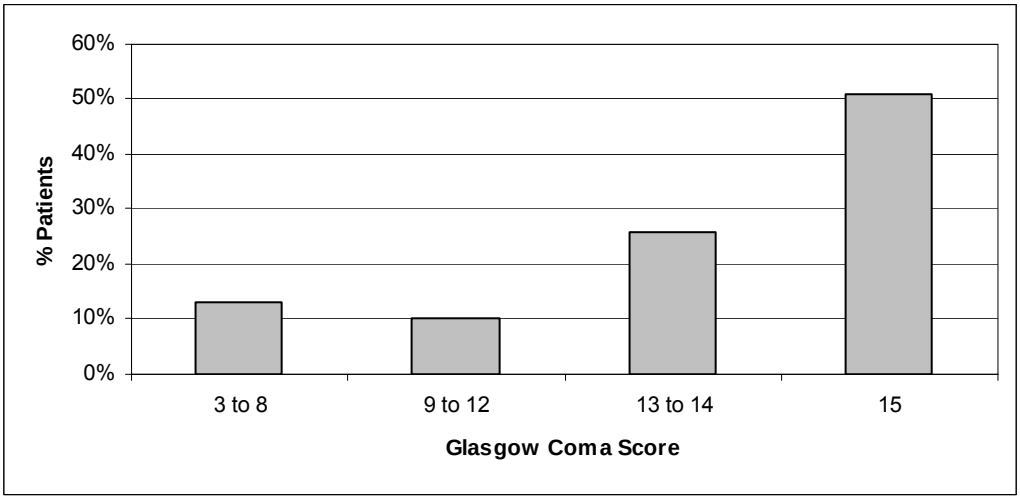
comparison of distribution across the triage categories of drug-positive and drug-negative trauma patients is not available.

Table S9: Triage category allocation for MVA patients, all trauma patients, and all drug-positive enrolments.

	Number of Patients (%)		
Triage Category	**MVA**	**All Trauma**	**All Enrolments**
1	41 (57)	82 (60)	188 (17)
2	30 (42)	52 (38)	397 (35)
3	1 (1)	2 (2)	411 (36)
4	0	0	127 (11)
5	0	0	11 (1)
Total	72	136	1134

Of the 136 trauma patients approximately 13% had a GCS in the range 3 to 8 ('severely' depressed conscious state). This figure is not dissimilar to those seen with other patient sub-groups examined apart from GHB (58% with GCS 3 to 8) and THC (5% with GCS 3 to 8).

Figure S4: Conscious levels of drug-affected trauma patients as measured by the Glasgow Coma Score (GCS): 3 to 8 (severe depression of conscious state), 9 to 12 (moderate depression), 13 to 14 (mild depression), 15 (normal).



Over 27% of drug-affected trauma patients were admitted for longer than a week (Table S10), and 26% were admitted to either ICU or HDU (Tables S11 & S12).

Table S10: Length of stay in hospital for drug-positive patients presenting as a result of trauma.

Length of Stay	Number of Patients (%)	
	MVA	All Trauma
< 1 day	30 (41)	52 (38)
1 day	10 (14)	15 (11)
2-7 days	12 (17)	33 (24)
> 7 days	20 (28)	36 (27)
Total	72	136

Tables S11 and S12: Place to which trauma patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total (%)
Discharged	23 (32)
Admitted	
EECU	9 (13)
ICU/HDU	19 (26)
General Ward	21 (29)

Disposition from Hospital	Total (%)
Home	60 (84)
Absconded	3 (4)
SAPOL custody	1 (1)
Rehabilitation	8 (11)
Total	72

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit)

Summary:

Enrolments:

- Collection of data specific to trauma patients commenced in February 2005
- Of the 1434 enrolled patients in the period February 2005 to February 2006 1377 (96%) returned positive blood tests. Of these 136 (10%) presented as a result of trauma.

Demographics:

- MVAs were the most common cause of trauma (53%) followed by assault (40%)
- The majority were male, Caucasian, and between 18 and 35 years of age; 7% Indigenous
- The most likely time of presentation was between midnight and 6am Sunday; 50% presented between 6pm Friday and 6am Monday
- 42% of drug exposures in those in whom it was recorded occurred in a licensed premises.

Patterns of Drug Use:

- 80% of drug exposures were due to Illicit Drug Use

- The most frequently detected drugs were alcohol, THC, amphetamines, and benzodiazepines
- Benzodiazepines were proportionally much less frequently detected in trauma patients than drug-positive enrolments generally
- Poly-substance abuse was common (49% of all trauma and 51% of MVA patients positive to more than 1 drug)
- The average number of drugs per patient was 1.78 in MVA and 1.65 drugs in all trauma patients.

S2 INJECTING DRUG USERS

Enrolments:

Results and discussion in this and the following sections, unless otherwise stated, are limited to drug positive enrolments only.

Of the 1530 enrolled patients returning positive drug tests between August 2004 and February 2006, a total of 138 (9%) were identified as having administered one or more of the drugs intravenously (IDU).

Demographic Details:

Ethnicity, Age and Gender:

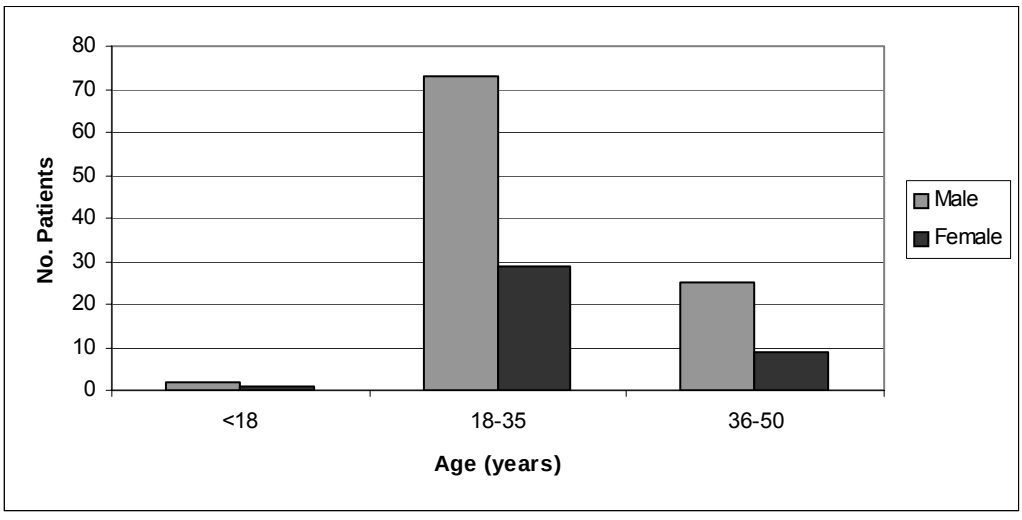
The overwhelming majority of patients were Caucasian (90%) with the next largest ethnic group being Indigenous patients representing just 9% (Table S13), proportions similar to that for Illicit Drug Users generally (89% and 6% respectively, Table 26).

Table S13: Ethnicity of IDU patients.

Ethnicity	Number of Patients (%)
Caucasian	124 (90)
Indigenous	13 (9)
African	1 (<1)
Total	138

The large majority of patients were male (72%) and aged between 18 and 35 years (74%) (Figure S5). Three patients were under 18 years of age. The male predominance held across all age groups.

Figure S5: Age and gender distribution of IDU patients.



Time of Presentation:

The distribution of time of presentation across the day of week and time of day for enrolled IDU patients was quite broad (Table S14). This may be due to the small numbers in whom this data was collected. Mode of transport to the ED was mostly via ambulance services (Table S15).

Table S14: Day and time of presentation to the ED of IDU patients.

Time	Sun	Mon	Tues	Wed	Thur	Fr	Sat	Total (%)
0001-0559	3	2	3	3	1	2	4	18 (17.6)
0600-1159	4	2	2	5	2	7		22 (21.6)
1200-1759	4	8	2	2	3	8	4	31 (30.4)
1800-2400	6	2	4	3	9	2	4	30 (29.4)
Total	17	14	11	13	15	19	13	102
% of total	16.7%	13.7%	10.8%	12.7%	14.7%	18.6%	12.7%	

(Phase 2 data only, *n* = 102)

Table S15: Mode of arrival to the ED for IDU patients.

Mode of Arrival	Number of Patients (%)
Ambulance	64 (63)
Police/Custodial	10 (10)
Private car	11 (11)
Unknown/Other	17 (17)
Total	102

(Phase 2 data only, *n* = 102)

Patterns of Drug Use:

Almost all IDU patients presented as a result of Illicit Drug Use (123 of 138 or 89%) with the remainder presenting due to Self-Harm (15 of 138 or 11%).

The number of IDU patients returning positive drug tests for the major drug types is shown in Table S16. Perhaps not surprisingly, the relative detection rates of the major injectable drug groups such as amphetamines and opioids are considerably higher than that seen in Illicit Drug Use group generally. The lower rates of alcohol use and the higher rates of THC and benzodiazepine use in this group of patients were comparable with the IDRS sample[16].

Table S16: Comparison of the number of IDU and Illicit Drug Use patients returning positive tests for the major drug types.

Drug Type	Number of Patients (%)	
	IDU	Illicit Drug Users
Alcohol	38 (28)	443 (64)
THC	65 (47)	193 (28)
Amphetamines	65 (47)	191 (28)
Benzodiazepines	68 (49)	128 (19)
Opioids	50 (36)	83 (12)
Antidepressants	7 (5)	36 (5)
LSD	2 (2)	5 (>1)
Antipsychotics	1 (<1)	
Others	14 (10)	
Total no. patients in group*	138	687

The percentages (%) are of the total number of IDU and Illicit Drug User enrolments respectively. (*Sum of columns is greater than total number of patients as many tested positive to more than 1 drug)

As has been the case with all sub-groups analysed, poly-substance abuse was prominent in IDU patients, with the 104 patients returning a total of 417 positive drug tests (an average of 3.0 drugs per patient) (Table S17). Tables S18 to S20 list the frequency with which the specific drugs within each major drug class were detected.

Table S17: Comparison of the number of IDU patients and Illicit Drug Users testing positive for 1 or more drugs.

Number of Drugs	Number of Patients (%)	
	IDU	Illicit Drug Users
1	28 (20)	282 (41)
2	57 (41)	221 (32)
3	31 (22)	141 (21)
>3	24 (17)	43 (6)
Total	138	687

Table S18: Frequency of detection of benzodiazepines in IDU patients.

Drug Name	Number of Positive Tests
Temazepam	12
Clonazepam	8
Nordiazepam	60
Oxazepam	17
Alprazolam	17
Nitrazepam	3
Total	117

(nordiazepam is the principle metabolite of diazepam)

Table S19: Frequency of detection of amphetamines in IDU patients.

Drug Name	Number of Positive Tests
Methamphetamine	66
MDMA	0
Amphetamine	33
Total	99

Table S20: Frequency of detection of opioids in IDU patients.

Drug Name	Number of Positive Tests
Morphine	32
Methadone	19
Codeine	18
Heroin	3
Total	74

Interestingly, very few ecstasy and related drugs were detected in IDU patients. There were no cases of MDMA, GHB, or ketamine, although 2 cases of LSD and 2 of cocaine were detected.

The drugs stated to have been injected prior to presentation by the IDU patients are shown in Table S21. As discussed in “Opioids” and “Amphetamines” in Section 3.3., the detection rates of amphetamine versus methamphetamine and heroin versus morphine likely differ from the actual rates of drug use due to the effects of metabolism of the parent compounds in the interval between administration and presentation to the ED and blood sampling. It is likely that the relative prevalence of use of these drugs is more accurately reflected in Table S21 than in Tables S19 and S20. This is also supported by the data in Table S22 which shows the frequency of drug use reported by IDU patients.

Table S21: Number of occasions a drug was recorded as being injected prior to presentation.

Drug Type	Number of Occasions
Unknown tablet	13
Cocaine	2
Methadone	11
Opioids – not specified	2
Heroin	35
Morphine	17
Amphetamine	51
Methamphetamine	12
Dexamphetamine	1
Oxazepam	1
Alprazolam	1
Benzodiazepine – not specified	1
Other	2

Table S22: Frequency of drug use reported by IDU patients.

Reported Drug Use	Frequency of Use						
	Daily	Week	Month	Year	Not specified	Past use only	Total Responses
Cigarettes	73	1	2		1		77
Alcohol	36	23	5		12		76
Cannabis	29	10	6		7	1	53
Amphetamines	23	22	5	1	16		67
Methamphetamine	6	10	4	2	16		38
GHB/Fantasy		1	2		1		4
Ketamine			1		1		2
Cocaine		1		1	2	1	5
Benzodiazepines	15	4	1		8		28
Solvents					1		1
Nitrous/Bulbs				1	1		2
Amyl/Rush				1			1
LSD/Acid			2	2	4	1	9
Ecstasy		3	2	1	4		10
Heroin	8	8	7	2	22	4	51
Mushrooms			1		3		4
Other					1		1
Opioids	7				4	1	12

(*Stated drug used but frequency of use not recorded)

Clinical Correlates:

The triage categories allocated to IDU patients on presentation to the ED are shown in Table S24. Interestingly, a comparison with allocations for Illicit Drug Use enrolments generally shows almost half the rate of priority 1 cases. This result was unexpected as it was anticipated that with the higher peak blood concentrations expected with intravenous compared to oral drug exposure (with any given dose) an increased acuity of illness would be expected. This may be due to bias from the relatively small sample size of this group.

Table S23: Triage category allocation for IDU patients compared to that for Illicit Drug Use enrolments generally.

	Number of Patients (%)	
Triage Category	**IDU**	**Illicit Drug Users**
1	10 (10)	123 (18)
2	55 (40)	234 (34)
3	58 (42)	229 (33)
4	15 (15)	92 (13)
5	0	9 (1)
Total	138	687

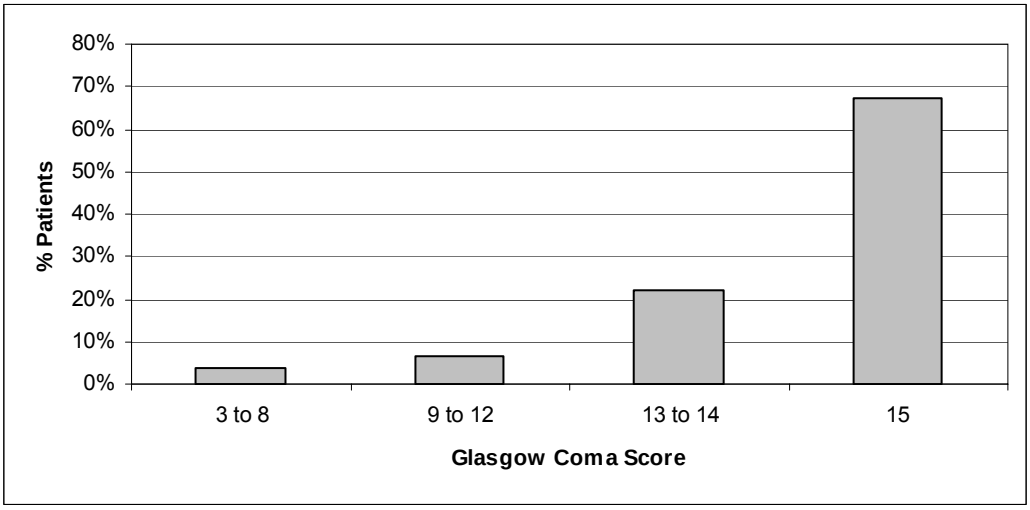
Of the 138 patients presenting following IDU, 115 (83%) had a recorded past history of IDU. Of the 138 patients, 2 were known to have hepatitis B, 42 to have hepatitis C, and 3 HIV (Table S24).

Table S24: Number of patients previously known to be an IDU, and hepatitis or HIV positive.

Behaviour	Number of Patients
IV Drug Use	115 (83)
Hepatitis B positive	2 (1)
Hepatitis C positive	42 (30)
HIV positive	3 (2)

Of the 138 IDU patients only 5% had a GCS in the range 3 to 8 ('severely' depressed conscious state, Figure S6). This percentage is similar to that seen with THC (5% with GCS 3 to 8) but approximately half that of other patient sub-groups examined apart from GHB (58% with GCS 3 to 8).

Figure S6: Conscious levels of IDU patients as measured by the Glasgow Coma Score (GCS): 3 to 8. (severe depression of conscious state), 9 to 12 (moderate depression), 13 to 14 (mild depression), 15 (normal).



The rates of admission to hospital and admission to critical care units from ED however, is similar to that for the Illicit Drug Use group generally (Tables S25 & S26).

Tables S25 and S26: Place to which IDU patients were discharged on leaving the ED and the Hospital.

Disposition from ED	Total
Discharged	72 (52)
Admitted	
Transferred	6 (4)
EECU	37 (27)
ICU/HDU/Spinal	9 (7)
General Ward	9 (7)
Psych ward	5 (4)
Total	138

Disposition from Hospital	Total
Home	105 (76)
Absconded	19 14)
SAPOL custody	5 (4)
Psychiatric Services	8 (6)
Other	1 (<1)
Total	138

(ICU = Intensive Care Unit, HDU = High dependency Unit, EECU = Emergency Extended Care Unit)

Summary:

- The period of data collection specific to IDU covered by this section was from August 2004 to February 2006
- Of the 1530 drug-positive enrolments in this period 138 patients (9%) were identified as IDU
- 91% were Caucasian, 9% Indigenous
- The male to female ratio of IDU patients was approximately 5 to 2.
- 89% presented as a result of Illicit Drug Use
- The most frequently detected drugs were: benzodiazepines (49%), amphetamines (47%), THC (47%), opioids (36%), and alcohol (28%).
- None of the ecstasy (MDMA) and related drugs such as GHB or ketamine were detected in IDU patients; 2 cases were positive for LSD
- Poly-substance abuse was prominent in IDU patients, with the 138 patients returning a total of 417 positive drug tests (an average of 3.0 drugs per patient)
- 80% tested positive to more than 1 drug, 17% to more than 3 drugs.

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D_2EWS ALERT

Designer Drug Early Warning System **September 2005**

The Designer Drug Early Warning System or D_2EWS is a clinical toxicology database and monitoring process for drugs of abuse in patients presenting to the Royal Adelaide Hospital Emergency Department (RAH ED), and run jointly with the Drug & Alcohol Services of SA (DASSA). The D_2EWS Alerts are designed to inform hospital emergency workers with timely information about recent drug events within the RAH ED. The information contained within the Alerts is general in nature and more specific detail can be obtained by contacting the RAH ED.

Heroin

14 cases involving heroin use have presented to the Emergency Department of the RAH in the past 2 months; there has been 1 fatality.

This contrasts significantly with attendance figures since 2001, when the number of hospital presentations following heroin use, both fatal and non-fatal, dropped markedly (see table below). This fall is attributed to a significant reduction in the availability of heroin.

Of note is the fact that there has not been a rise in police seizures or arrests related to heroin concomitant with the current increased RAH ED attendances. This may reflect increased toxicity due to altered usage patterns, altered purity of drug, or recent increased availability which is not yet reflected in data from other monitoring mechanisms.

1999 – 2000	221
2000 – 2001	121
2001 – 2002	30
2002 – 2003	38
2003 – 2004	25
2004 – 2005	30
2005:	
• March/April	6
• May/June	7
• ***July/August***	***14***

Heroin related presentations to RAH ED.

Heroin

- Diacetylmorphine – hydrolysed to monoacetylmorphine (MAM), then morphine and excreted in the urine as free and conjugated morphine. Metabolites are present for 48 hours post use.
- Overdose (OD) is marked primarily by signs of decreased level of consciousness to coma, respiratory depression. Characteristic pinpoint pupils may become dilated with significant cerebral hypoxia. There is a high risk of aspiration due to reduced gastric motility combined with depressed conscious level.
- Risks for OD include polydrug use, particularly other CNS depressants (ethanol, benzodiazepines); resumption of use after a period of abstinence; injecting alone and in an unusual setting.
- Most fatal ODs involve experienced users (<1% are novices) and many have less morphine levels below those generally considered fatal .
- High risk profile: male, 30 years old, unemployed, known IVDU, previous OD, misuses prescription drugs, with chaotic life circumstances.
- Most recent reports on:
  - Availability: easy to get
  - Purity: moderate
  - Price: $320/g or $50/cap (near pre-2002 prices)

For more information please contact Ms Jennifer Spike at the RAH ph 8222 4000, or Mr David Newcombe at DASSA ph 82743369.

DRUG ALERT

D2EWS - Designer Drug Early Warning System **June 2005**

The Designer Drug Early Warning System or D_2EWS is a clinical toxicology database and monitoring process for drugs of abuse in patients presenting to the Royal Adelaide Hospital Emergency Department (RAH ED). The D_2EWS Alerts are designed to inform hospital emergency workers with timely information about recent drug events within the RAH ED. The information contained within the Alerts is general in nature and more specific detail can be obtained by contacting the RAH ED.

Lysergic Acid Diethylamide (LSD)

Two confirmed cases of LSD intoxication have recently presented to the RAH ED within a short space of time. Confirmation of three further cases is pending. Generally reported to be episodically seen in the ED and by Police seizures, it is possible that we are experiencing an acute increase in usage.

Clinical Presentation

Both, Caucasian males, presented with a Glasgow coma scale score of 15 on arrival at the RAH, but reported feeling 'weird' or 'not quite right'. One, a first time user presented with tachycardia and ST elevation on ECG, shortness of breath, was flushed, had dilated pupils and was experiencing visual hallucinations. The other, a seasoned user, had been tachycardic at the scene but had settled upon arrival. He had also consumed MDMA.

Treatment

Both victims were given IV fluids, had routine bloods taken. The more symptomatic victim was given diazepam to settle. Both had a low phosphate level (0.29, 0.40)

They were discharged from the ED within 3-4 hours of presentation.

ROYAL ADELAIDE HOSPITAL
EMERGENCY DEPARTMENT

LSD Facts

- LSD (lysergic acid diethylamide) is a powerful hallucinogen which can produce significant changes in perception, mood and thought. Generally the effects of LSD are unpredictable, but only a very small amount is needed to cause visual hallucinations and distortions. These experiences are known as 'trips'.
- LSD is usually sold in perforated paper sheets from which small squares ('tabs') are detached. A small amount of the chemical is soaked into each square. It is colourless, odourless and tasteless or slightly bitter.
- Each square is usually decorated with a design, often culturally specific to the user group.
- The street name for LSD is often dependent on the decoration design, but may also be generally referred to as acid, trips, blotters, microdots, tabs, tickets, holidays.
- Physical effects: dilated pupils, hyperthermia, tachycardia, hypertension, sweating, insomnia, dry mouth, tremors.
- Sensory effects: sense of anticipation, anxiety, dread, feelings of insight, confusion, paranoia, quickly changing emotions, delusions, visual hallucinations, inability to control emotions.
- After effects: flashbacks up to a year later, which may occur suddenly & without warning, psychoses - long lasting or brief.

For more information please contact Dr Michael Davey, Dr Tony Eliseo, Ms Jennifer Spike at the RAH pH; 8222 4000.

APPENDIX B NUMBER OF PATIENTS WITH POSITIVE DRUG TEST

Drug	No. positive tests	Number of patients with positive drug test					
		Self-Harm	Illicit Drug Use	Other*	Drink Sp	Susp*	Total
Alcohol	670	139	434	6	68	23	670
Cocaine	8	2	6				8
GHB	36		31		4	1	36
Ketamine	6		5			1	6
LSD	5		5				5
THC	259	39	184	3	7	26	259
Benzodiazepines	608	164	198	10	7	18	397
Diazepam		110	156	6	7	13	292
Temazepam		50	23	3	0	3	79
Clonazepam		3	13			1	17
Nordiazepam		118	164	6	6	14	308
Oxazepam		38	33	2	1	1	75
Alprazolam		29	41	2	0	4	76
Lorazepam		4	1				5
Nitrazepam		7	4	1			12
Bromazepam		1	1				2
triazolam		1					1
Flunitrazepam		1					1
Opioids	189	54	83	6	0	6	149
Methadone		8	29	1		4	42
Heroin			4				4
Morphine		15	39	2	0	0	56
Dextropopxyphene		3	2				5
Oxycontin		1		1			2
Codeine		38	36	4	0	2	80
Amphetamines	341	19	191	0	21	16	247
Amphetamine		1	44		3	3	51
Methamphetamine		12	137	0	14	16	179
Pseudoephedrine		7	3				10
MDMA		3	77		10	4	94
Ephedrine			2				2
MDA			2			1	3
MDEA			1		1		2
Phentermine			1				1

Drug	No. positive tests	Number of patients with positive drug test					
		Self-Harm	Illicit Drug Use	Other*	Drink Sp	Susp*	Total
Antidepressants	140	82	36	3	2	7	130
Mirtazapine		9	1				10
Amitryptiline		7	2				9
Fluoxetine		7	5				12
Citalopram		26	9	2	1	3	41
Moclobemide		1					1
Sertraline		12	4	1		1	18
Venlafaxine		25	17		1	3	46
Raboexetine		1					1
Fluvoxamine		2					2
Antipsychotics	35	28	4	0	1	0	33
Quetiapine		11	3				14
Olanzapine		11					11
Clozapine			1				1
Chlorpromazine		7			1		8
Others	108	42	39	4	3	4	92
Propranolol		1					1
Lignocaine		11	20	2	3	2	38
Oxypropranolol			1				1
Doxylamine		4					4
Lamotrigine		1	2			1	4
Zolpidem		9		1			10
Metoprolol		1					1
Dextromethorphan		2					2
Promethazine		4	2	1			7
Kava			1				1
Carbamazapine		5	6			1	12
Tramadol		6	4				10
Quinine			2				2
Tripolidine		2					2
Bupropion			2				2